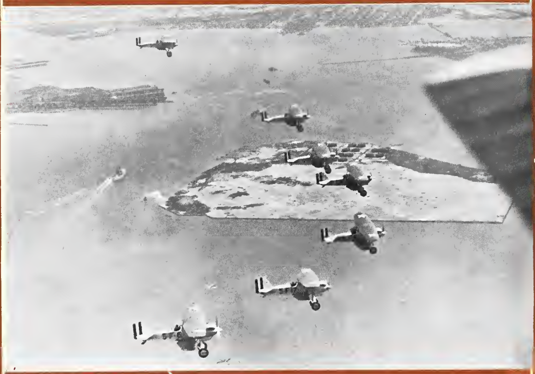
AVIATION

The Oldest American Aeronautical Magazine

JULY 18, 1927 — Issued Weekly — PRICE 15 CENTS



A Formation of Curtiss "Hawks" of the Marine Corps

VOLUME XXIII

NUMBER 3

SPECIAL FEATURES

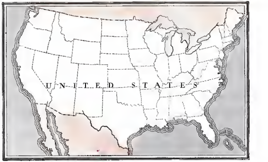
GERMAN AIR TRANSPORT
TAIL SPINS AND FLAT SPINS
THE ALL METAL DORNIER SUPERWAL

AVIATION PUBLISHING CORPORATION

Editorial and Business Offices
250 WEST 57 STREET, NEW YORK

Publication Office
HIGHLAND, N. Y.

Entered as Second-Class Matter, Nov. 22, 1920, at the Post Office, at Highland, N. Y. under Act of March 3, 1879



In every city in the United States Mobiloil is on sale

Wherever you fly no lubrication worries need go with you!

Today flying is widespread business Look at the map above Then remember that there are more than 300 municipal flying fields in this country There are over 200 commercial fields The total number, including temporary fields mounts to over 3600

But there is one worry you can leave behind — whatever your destination You will always find supplies of Gargoyle Mobiloil awaiting you

Mobiloil is sold at, or within reasonable distance of every landing field in this country The United States is thickly dotted with Mobiloil dealers And so are foreign countries

No other oil is so convenient to buy throughout the world

And with Mobiloil lubricating your engine you know your engine will get the protection it should have Mobiloil is used by a majority of the airplane manufacturers for test and development work Mobiloil has a long and enviable record of providing lubrication on outstanding flights

In short, Mobiloil sets the world's standard in quality It is made by the oldest and most successful company specializing in lubrication

Colonel Lindbergh has used Mobiloil in every flight he has made in the *Spirit of St. Louis*

GARGOYLE
Mobiloil

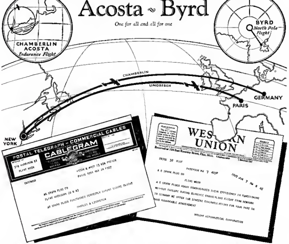
The U. S. Army Pilots used Mobiloil in their recent record-breaking flight from San Francisco to Hawaii.

VACUUM OIL COMPANY MAIN BRANCHES *New York, Chicago, Philadelphia, Boston, Buffalo, Detroit, Pittsburgh, Minneapolis, St. Louis, Kansas City, Dallas*

Other branches and distributing warehouses throughout the country

Lindbergh ~ Chamberlin Acosta ~ Byrd

One for all and all for one



THERE are no Service Stations along the route of a trans-Atlantic or polar flight.

In such a test, failure of a single spark plug might spell the difference between triumph and disaster.

In that first successful non-stop flight across the Atlantic, Colonel Charles A. Lindbergh placed his firm faith in AC Spark Plugs.

For his historic flight from New York to Germany, Clarence D. Chamberlin relied upon AC Spark Plugs.

Acosta and Chamberlin, in 51 hours of continuous flying above Long Island, established a world's endurance record with AC Spark Plugs.

Commander Byrd, in his daring flight to the North Pole and return, marked up still another clean score for AC Spark Plugs.

If you should ask Lindbergh, Chamberlin and these other great flyers what plug they recommend, they would tell you AC—the plug on which they staked their lives.

Dealers, tell your customers AC is the plug used by Lindbergh, Chamberlin and other great flyers.

Tell them you can give them the same kind of AC Plugs—same insulation, same quality of electrode, same basic design, that made possible these record breaking flights.

If you tell these facts, you can sell an even greater volume of AC Spark Plugs.

AC Spark Plug Company, FLINT, Michigan

AC-SPHINX Birmingham ENGLAND	*Makers of AC Spark Plugs* *AC Speedometers—AC Air Cleaners* *AC Oil Filters—AC Gasoline Strainers*	AC-TITAN Levallois-Perret FRANCE

Over 200 of the world's most successful manufacturers use one or more, or all of these AC Products
AC SPARK PLUGS AC SPEEDOMETERS AC AIR CLEANERS AC OIL FILTERS

A part of the fleet of 25 Boeing Air Mail Planes (Wasp Engines) ready to leave Seattle, Washington

AVIATION

AVIATION PUBLISHING CORP.
Business and Editorial Offices—250 W. 57TH ST., NEW YORK
Cable Address—AEROENG
Publication Office—HIGHLAND, N. Y.

EARL D. OSBORN
President and Editor

LESTER D. GARDNER
Publisher

GEORGE NEWBOLD
Business Manager

L. D. WEBSTER
Treasurer

Vol. XXIII JULY 18, 1927 No. 3

Index to Contents

Subscription price: Four dollars per year. Canada, five dollars. Foreign, six dollars. Single current copies, fifteen cents. Back numbers, 25 cents. Advertising rates on application.

Issued every Monday. Forms close ten days previously. Entered as second-class matter Nov. 22, 1920, at the Post Office at Highland, N. Y., under act of March 3, 1879.

With the Editor

In answer to recent criticisms of formation flying and landing in formation, officials of the Army Air Corps advanced the arguments that if Army Air Corps units are to be equipped for war purposes, aerial combat tactics must be rigorously pursued in peace time, and that formation flying and landing in formation is a fundamental of military flying. In short—the Army Air Corps is of the firm belief that in time of peace one should prepare for war. And in this respect it would appear that the Army Air Corps is 100 per cent correct.

If in time of peace every effort is being constantly devoted to a continued improvement in the design and construction of war airplanes, it is only logical that an equal amount of effort should be devoted to their most effective operation, so that in the event of war a maximum of Army Air Corps performance can not only be expected, but delivered.

True, in the late war, individual aerial work predominated, but it was not so much a matter of choice as it was necessity. The task of clearing the skies of enemy aircraft and cooperating with the land forces did not allow sufficient time for the conducting of formation flying experimentation. However, in the closing months an increased amount of formation flying was being accomplished and the cold figures of the official war records show the proof of its value.

AVIATION

The Oldest American Aeronautical Magazine

Vol. XXIII JULY 18, 1927 No. 3

Passing of the "Jenny"

AFTER HAVING served the country effectively for ten years, the JN4 type of airplane will officially pass out of the picture as a military plane on September 1. The announcement has been made by the Secretary of War that on that date all JN4 planes in the Army will be retired and salvaged, and no more of this type of plane will be used. This progressive step might well have been taken some time ago in regard to most of the war time planes, to encourage further development in airplane designs and building, as well as to contribute to greater safety in flying by substituting for the old war stock, much of it hard driven over long years, newly built equipment.

The record of the JN4 is an honorable one and the affection for it by the large army of pilots and former pilots will live on. That this type of plane—a creation of the infant days of aviation—has lasted through a period of ten years, is a splendid tribute to its design and construction. But it has served its purpose. Aviation has progressed and the beloved "Jenny", like all mechanical contrivances must give way to the newer requirements that mark progress.

It will be some years, however, before the last "Jenny" disappears in the United States. There is scarcely a flying field in the country that has not in daily use one or more of these planes. But gradually their numbers will diminish and when the last Jenny wings its way across the sky the old guard will have its head and say, "There was a ship."

Seaplane Anchorages

IN THE campaign that is being carried on throughout the country for more landing fields, the United States Navy has lately made an important contribution.

The general public thinks of air terminal facilities only in the term of fields on land, little realizing the need of special study of conditions necessary for location of good anchorages for seaplanes. While it is true a seaplane can sat down and take off on any water deep enough and spacious enough to maneuver in, there is more required for safe anchorage than room and depth. There must be accurate information as to the character of the bottom for anchoring, nature of the currents and tides, direction of prevailing winds and possible harbor obstructions, as well as facilities for fueling, oiling, repairing and communication.

In its splendid series called Naval Air Pilot, published by the Hydrographic Office at Washington under the direction of the Secretary of the Navy, the Navy Department has covered this ground effectively. The Naval Air Pilot, to date, comprises 80 pocket size charts in colors, each chart covering the seaplane anchorage facilities of a given locality. These eighty charts cover the territory from East Port, Me., to Key West, Fla., and furnish an ample guide for laying out a seaplane course along the entire Atlantic Coast line.

With the excellent work of the Department of Commerce in charting, with much detail, our terminal and intermediate land fields, and with the Navy, through its Naval Air Pilot, making a good start towards the charting of our seaplane anchorages, American air pilots are receiving strong and practical support from the federal government in respect to an intelligent compilation of our land and sea plane terminals.

Aerial Advertising

ADVERTISING HAS become a very complicated business which is being handled more and more by specialists. As a result of long experience and observation these specialists have developed a science of advertising and they know just what kind of advertising medium gets the best results for a given kind of article. Knowing these things with such certainty the advertising agencies which handle the advertising of large firms are apt to look at any new medium with distrust and this applies especially to the advertising which is done by airplanes.

There are many forms of aerial advertising. The simple dropping of pamphlets was one of the first methods devised and is still used in towns where it is not prohibited. Skywriting, loud speakers, illuminated wings and many other devises have been tried. To the flying enthusiast these are wonderful methods of advertising but to the professional advertising man they are merely stunts because they are not followed up and do not permanently impress the public with the name of the product advertised.

Both the flier and the advertising man are to some extent right and undoubtedly aerial advertising has been greatly retarded because the flier does not understand the fundamentals of advertising and because the advertising man does not realize the amount of interested attention which is obtained by aerial advertising. The solution seems to lie in the specialization by some firm of aerial advertising much as some firms specialize in outdoor advertising or in street car advertising. Here is an opportunity for some firm to start in and develop a business which has real possibilities of growth and permanence.

The All Metal Dornier Superwal

Claimed to be World's Largest Flying Boat and is Powered With Two Rolls Royce 650 Hp. Engines

THE DORNIER-METALLBAUTEN (Dornier-Metal Building-Construction Co.) of Friedrichshafen, Germany claim to have constructed the world's largest flying boat, the Dornier Superwal. It resembles the Dornier Wal in that it is of all metal construction having a large main wing above the hull and a short wing stub on each side of the hull. It is powered by two Rolls Royce 650 hp. engines arranged in tandem above the upper wing. The Superwal is much larger than the Wal, weighing close to ten tons or fifty per cent more. At Lake Constance, Germany, it successfully completed the first test flights carrying twenty-five people. While the Wal is the holder of many records, the performance of the Superwal is such that it bids fair to eclipse its predecessor. It is a Dornier Wal that Capt. Courtney is preparing for his westward hop across the Atlantic.

The Dornier Superwal in flight

Built Entirely of Metal

A characteristic feature of all Dornier flying boats is the short wing stub or fin at each side of the hull. As the center of gravity is rather high, the stubs are necessary to provide lateral stability on the water. These water stabilizing stubs are of airfoil section giving lift while in flight, besides obliterating the necessity of wing tip floats when on the surface. The strength of these stubs is such that wheels can be fastened to them to facilitate moving the plane over land.

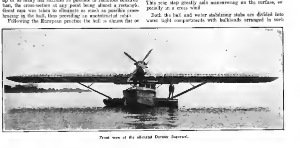
The Superwal is built entirely of metal. All vital parts are made of alloy steel. The hull as well as parts of the wing that are subject to lesser strains are made of duralumin. For internal bracing, pressed sheet metal is used throughout as contrasted with steel tubing which has found such favor in this country. Dornier practice has been to have the wing and hull covering carry the stresses rather than the internal structure. This covering is usually of flat duralumin riveted to a built up frame work with external stiffeners fastened to the covering parallel to the flying direction.

Hull is Well Streamlined

The hull, which contains the cabins is well streamlined. It is very similar to that of the Wal except that the bow is sharper. While not as efficient aerodynamically, a better performance on the surface is thus attained. The hull is built up of as many flat surfaces as possible to facilitate construction, the cross-section at any point being almost a rectangle. Great care was taken to eliminate as much as possible cross-bracing in the hull, thus providing an unobstructed cabin.

Following the European practice the hull is almost flat on the bottom. The slight V at the bow is reduced until the bottom is flat at the first step. The step is so constructed that it is deeper at the keel than at the chines. The rear step, if it may be called such, is of unique design. It is a protuberance on the hull extending from the first step backward. Its bottom tapers, gradually increasing in depth at the keel from a flat surface at the first step until there is a slight V at the end, which might be called the second step. This surface does not extend the full width of the hull. In plan view it tapers to a point giving it a streamline form. This rear step greatly aids maneuvering on the surface, especially in a cross wind.

Both the hull and water stabilizing stubs are divided into water tight compartments with bulkheads arranged in such



Front view of the all-metal Dornier Superwal.

a manner that the compartments are easily accessible for inspection or repair. The arrangement of pilot, radio, passenger and freight compartments depends on the service for which the plane is to be used. At present the Superwal is fitted for commercial purposes.

Beneath the engine mount and close to the center of gravity is a compartment used as a tank room in which 830 gal. of gasoline are carried. It is natural that the other varying loads should be placed close to the center of gravity. For that reason the passengers are provided with two cabins, the forward one housing thirteen passengers in front of the tank room, and the rear passenger cabin housing eight. Luggage and freight is carried in a space in the hull behind the rear cabin. The main entrance to the plane is beside the pilots' cockpit at the bow in front of the forward passenger cabin. Adjoining the cockpit are the radio compartment and lavatory. There is an emergency exit in the rear of the plane above the rear passenger cabin.

Passenger Comfort Provided

Every possible measure has been taken to provide for the comfort and convenience of the passengers. The Superwal is equipped and furnished in luxurious style. A free unobstructed view for the passengers is made possible by means of large plate glass windows. The remoteness of the pilots' cockpit to the engines is more than compensated for by the

The hull of the Superwal in the Dornier shops at Friedrichshafen.

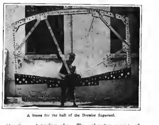
excellent vision attained. In this plane a cockpit close to the engines would make navigation very difficult.

There is a passageway connecting the tank compartment and the engines. The forward side of this passageway carries the cooling radiators while the rear portion is provided with shutters. The air passes through the radiator, across the passageway and out through the shutters. By connecting this passageway to the passenger cabins a very efficient heating system results.

The engines, two Rolls Royce 650 hp., are arranged in tandem above the wing. As the engine mount was designed with a large safety factor, engines up to 1,000 hp. can be used. The tandem arrangement has been the topic of a great deal of discussion. Both engines being combined in one nacelle reduces the drag considerably. The central arrangement enables one to maintain flight on one engine without having to balance out any resulting torques by means of side rudders.

The objection to having one propeller in the slipstream of the other and to having the two propellers turning in opposite directions has been raised. Extensive tests have been made by the Dornier Company at Seemos, Germany. They found, using two 240 hp. Maybach engines in tandem on a test stand, that there was a power loss of nine per cent. It is claimed that the resulting losses are considerably less in flight and that the advantages of the tandem arrangement more than compensate this loss.

A semi-cantilever wing construction is used. The supporting struts connect the mid-point of the semi-span of the main wing and the mid-point of the water stabilizing stub. The wings are built in three separate parts, the leading edge,



A frame for the hull of the Dornier Superwal.

mid section and trailing edge. The mid-section consists of two steel spars, with the necessary cross bracing, covered with duralumin sheeting. The leading edge is covered with duralumin while the trailing edge is covered with fabric. Any one duralumin sheet can be removed without disturbing any other sheet, thus facilitating inspection and repair. The internal structure of the wings is such that they can be covered entirely with fabric, increasing the useful load.

The tail surfaces are high above the water. Both fin and stabilizer are of two spar construction, the stabilizer being

The internal structure of the Superwal wing

externally braced. The rudder is conventional while the elevators are balanced by an auxiliary surface. All the tail surfaces except the fin are fabric covered.

This giant flying boat is equipped for extraordinary service. Its seaworthiness combined with its excellent performance lend it for use under the most adverse conditions. As a military plane its possibilities are again as great, giving a very dangerous offensive weapon.

Equipped with two Rolls Royce 650 hp. engines the general

dimensions and performance of the Dornier Superwal are

Span	94.7 ft
Chord	17.8 ft
Wing area	1,540 sq ft
Length overall	80.7 ft
Height overall	17.8 ft
Length of hull	77.1 ft
Breadth of hull	11.47 ft.
Breadth of hull with stubs	24.57 ft
Max speed (depending on loading)	118-130.5 m.p.h
Climb to 3,590 ft	14 min
Ceiling	10,520 ft
Range normal	1,368 mi
maximum	3,614 mi
Weight empty	12,800 lb
Useful load normal	7,940 lb
maximum	13,270 lb
Fuel for 1,368 mi	6,080 lb
Pilots	2
Mechanic	1
Radio operator	1
Passengers	21
Total	25

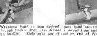
Useful Metal Clamp Placed on Market

An ingenious all-purpose clamp has been placed on the market by the Mosler Metal Products Co., Mt. Vernon, N. Y., known for many years as manufacturers of aviation spark plugs.

The clamp, patented under the trade name, "Wraplock", consists of rust-proofed strip steel and a galvanized steel buckle which together make a strong and effective device useful for many construction or repair purposes.

In Commander Byrd's Fokker monoplane Wraplock clamps are used to hold the fairing on the horizontal steel

How to Make Wraplock Clamps



Cut Wraplock band to size desired, pass band around work and through buckle, then pass around a second time and again through buckle. Slide split pin of tool on end of Wraplock tape, have it extend over the edge of the tape. Turn tool down away from rounded portion of buckle.

Keep turning tool until band rolled up has drawn so tightly that it forces itself into the rounded portion of the buckle. To remove tool raise slightly and slip it out of rolled up band.

tubes through which pass the engine controls, fuel line and tachometer shafting from the fuselage to the right and left outboard engines.

Wraplock is put up in a container similar to a metal rule and the strip steel is ruled out in the same way. In the container is a tray holding metal buckles and a small steel rachet with split pin attachment for tightening and locking the strip steel on the buckle, as shown in the illustrations.

The Wraplock clamping device is simple and it can be quickly applied. Coupled with its strength these features appear to make it a valuable aircraft accessory in the factory, field shop and emergency kit of the flier.

Stinson Leads Ford Tour at Hammond, Ind.

As AVIATION goes to press, Eddie Stinson piloting his Stinson monoplane still maintains a big point lead in the 1927 Ford Reliability Tour. At the close of last week's account of the event it was stated that at Baltimore, Md., Stinson had a total of 2,785.4 points to his credit. When thirteen planes checked in at the Ford airport near Hammond, Ind. on July 11, Stinson had increased his point score to 9,040.5 points.

Up until July 10 Randolph G. Page piloting a Hamilton all-metal monoplane was in second place but on the way to Wichita, Kan., from Tulsa, Okla., the plane was forced down by a broken valve, which, although soon repaired, enabled H. O. Mummert in a Mercury biplane to move into second place. At Hammond Mummert was credited with a point score of 7,150.7 points.

The planes took off from Logan Field, Baltimore, on the morning of July 2 en route for Pittsburgh, Pa. From Pittsburgh, where they had been greeted by thousands, the planes went on to Cleveland. When but six miles on the way Cloyd Clevenger piloting an Alexander Eaglerock was forced to return due to a broken engine connecting rod.

From Cleveland the route carried the planes to Kalamazoo, Mich., Dayton, Columbus and Cincinnati, O., Louisville, Ky., Memphis, Tenn., Pine Bluff, Ark., Dallas, Tex., Oklahoma City and Tulsa, Okla., Wichita, Kan., Omaha, Neb., Moline, Ill., and Hammond, Ind.

A feature of the arrival at Hammond was the attempt by the entrants to "bomb" the city. Circling about at a 1,000 ft. altitude the pilots attempted to drop rubber balls into a net stretched in Harrison Park. Little success was attained.

Next week's issue of AVIATION will contain an illustrated eye witness story of the finish of the tour and also a technical description of the planes.

Five Sections in Airways Division

Five sections have been organized within the Airways Division of the Aeronautics Branch, Department of Commerce, these being the Survey Section, Lighting Section, Radio Section, Weather and Communication Section and Maintenance Section. Airway extension superintendent George C. Miller has been placed in charge of the Survey Section and is assisted by eleven airway extension superintendents engaged in the survey of airways. Arrangements have been made for use of three airplanes in connection with the survey of airways, the planes being piloted by any one of the airway extension superintendents engaged in the survey. Each airway extension superintendent is assigned to the survey of approximately 200 miles of airway, with a chief of party in charge of the survey of each airway. Alvin W. Smith has been detailed as chief of party in charge of the New York-Atlanta Airway and has in his party three airway extension superintendents. W. T. Miller has been detailed as chief of party of the survey of the Los Angeles-Seattle Airway and has two airway extension superintendents in his party. John Bonforte has been assigned chief of party of the Salt Lake City-Pasco Airway and has two airway extension superintendents in his party.

The Lighting Section is in charge of Airway Engineer A. J. La Bute, assisted by one associate airway engineer and three airway extension superintendents for carrying out the supervision of installation of lighting facilities. Radio Engineer H. J. Walls has been assigned to the Airways Division to supervise the installation of radio facilities under the radio division of the lighthouse service. Thomas H. Chapman has been detailed to take charge of the Weather and Communication Section of the Airways Division. There are five associate and assistant airway engineers, seven airway mechanicians and eighty caretakers engaged in the maintenance of airway facilities in the field organization of the lighthouse service.

C. M. Young to be Director of Aeronautics

The appointment of Clarence M. Young of Des Moines, Iowa, as Director of the Aeronautics Branch, Department of Commerce, has been announced by William P. MacCracken, Jr., assistant secretary for aeronautics.

As Director of Aeronautics, Mr. Young will supervise the work of the entire Aeronautics Branch and act as first assistant to Secretary MacCracken. He was originally appointed Chief of the Air Regulations Division in October, 1926.

Awakening of national interest in commercial aviation following the successful transoceanic flights has greatly in-

Clarence M. Young, newly appointed Director of the Aeronautic Branch, Department of Commerce

creased the work of the Aeronautics Branch and necessitated the creation of the position, according to Secretary MacCracken.

With the organization of the Aeronautics Branch now complete and a trained personnel appointed to fill the positions authorized by the Air Commerce Act of 1926, Secretary MacCracken said that the appointment of Mr. Young to supervise the work will permit more timely service to civil aviators, aircraft and accessories manufacturers and others interested in commercial aviation.

Mr. Young was formerly a member of the American Expeditionary Forces serving with the aviation corps on the Italian front. At the close of the War he was held a prisoner in Austria after having been shot down over the enemy lines.

Up to the time of his appointment as Chief of the Air Regulations Division in the Department of Commerce he was closely identified with commercial aviation activities.

He was commanding officer of the 313th Air Squadron during the time that Col. Charles A. Lindbergh was a member of that organization. Officially representing the Department of Commerce, Mr. Young later examined Colonel Lindbergh for his license as transport air pilot under the Air Commerce Regulations and personally inspected and registered the Spirit of St. Louis as a commercial aircraft of the United States.

Contracts for Fifty Planes in a Year

The American Eagle Aircraft Corp. of Kansas City, Mo., announces that a contract has been signed with Charles Field of Brooklyn, New York, for the delivery of fifty planes in twelve months to the American Eagle Aircraft Distributors of New York, Inc. Mr. Field's corporation has contracted for New York and other adjoining states.

Additional announcement is made of the appointment of Fred E. Pereira of Chelsea, Mass., to act as distributor in that state. Mr. Pereira maintains headquarters at the Boston Airport.

New Balloon Stations to be Established

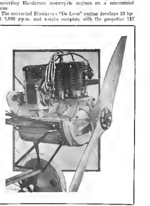
In a recent oral announcement W. R. Gregg, meteorologist in charge of the Aerological Investigations of the Weather Bureau, stated that funds for the establishment of eight new pilot balloon stations for upper air observation became available on July 1 and that several would be established immediately.

Stations will be established at Reno, Nev., Modena, Utah, Louisville, Ky., Havre, Mont., Sheridan, Wyo. and Knoxville, Tenn., by Aug. 1, and stations will also be established at Greensboro, N. C., and at a spot yet to be decided in the Southwest as soon after that as possible.

Heath Uses Converted Motorcycle Engine

The Heath Airplane Co. of Chicago, builders of the Heath Parasol, desired to power their product with an engine of twenty to thirty horsepower that was light in weight, compact, reliable, easy to maintain, and most of all, inexpensive. This was accomplished by converting the Henderson four cylinder "De Luxe" model motorcycle engine. Such success was met with the converted engine that the company is now converting Henderson motorcycle engines on a commercial basis.

The converted Henderson "De Luxe" engine develops 23 hp. at 3,000 r.p.m. and weighs complete with the propeller 117



The converted Henderson "De Luxe" engine

lb. The conversion consists of a special aluminum casting, stub shaft, thrust bearing and propeller hub.

The aluminum casting takes the place of the flywheel housing, which is sawed off at the flywheel. The flywheel and transmission are eliminated. A two bladed propeller of 4 ft. 10 in. diameter is driven direct from the crankshaft.

This engine, which was chosen for its low price and good all around performance, has been in use in Heath sport planes for some time. The Heath Parasol, a small monoplane equipped with this engine, gives a fine performance, having a top speed of 70 m.p.h. and a landing speed of 32 m.p.h.

German Air Transport

By LESTER D. GARDNER

This series of articles on German Air Transport is the result of a trip made by Major Gardner over the principal air routes of the Deutsche Luft Hansa last year. It has been supplemented by more recent data from various sources. The description of German Transport Planes has been taken almost entirely from an article in the May 7th issue of "Zeitschrift des Vereines Deutscher Ingenieure."—Ed.

ARTICLE ONE

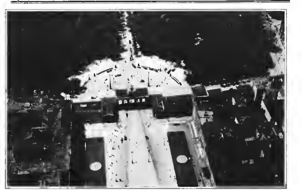
IN CONSIDERING the place of Germany in the world of aeronautics since the war, three developments stand out: the persistent and ever expanding civil air transport, the development of transport types of airplanes, and the dogged determination to continue, even under the most severe limitations, the building of the Zeppelin types of airships. The particular reason for this unique condition may be found in the limitations placed on Germany after the Armistice.

German air transport was hard hit by the London ultimatum of May 1921. The speed of German airplanes was limited to 106 m.p.h., the ceiling to 13,123 ft. and the commercial load to 1,323 lb. The 1000 hp. transport plane designed by Rohrbach and being built in the Zeppelin works had to be destroyed. The super-plane designed by Prof. Junkers could not be built and other limitations were placed on civil air transport that forced Germany to adopt a policy which has placed her far in the lead of all other countries in the air transport field. Deprived as the nation was of any military or naval aircraft, it was natural that the country that had made such valuable contributions to the science of aeronautics should seek an outlet for its genius in this field. Three things could be done. An aircraft industry could be kept alive. Airports of the most modern type could be created. Types of air transport airplanes could be produced. All of these would keep an aeronautical personnel at work and available until the restrictions could be lifted. This modification occurred in May 1926, due largely to the necessity as well as the advantages of reciprocal arrangements for flying over Germany by airplanes of other countries, which necessarily permitted German aircraft to fly elsewhere than in Germany. Without giving all the details of the original restrictions and the recent modifications, it may be said generally that Germany is now permitted to develop its Civil Aviation with only the limitation that the aircraft flown over air transport lines will not be susceptible of use for military purposes.

This point was made particularly emphatic during a talk with Ministerialrat Brandenburg, Director of the Air Traffic Department of the Germany Ministry of Communication. Minister Brandenburg had a distinguished war record, having commanded many of the German aircraft squadrons that bombed so successfully England and France. He received the highest honors for his war service. He was wounded many times in action, resulting in the amputation of his left leg. Since 1924 he has been the directing head of the only authority in Germany which deals with aerial matters (Luftfahrtableilung des Reichsverkehrsministeriums). It was Herr Brandenburg who encouraged the placing of orders with remnants of the wartime aircraft industry so that they would not lose connection with aeronautical development. He directed the reorganization of German air transport companies in 1925 and has been a leader in the efforts made by Germany to have the restrictions of 1921 removed. When seen in his office, he enquired if in the writer's travels over the air lines in Germany we had seen any evidence of a military development. As the answer was necessarily in the negative, Minister Brandenburg took occasion to emphasize the sincerity of purpose of those in charge of German Air Transport to develop air traffic along commercial lines exclusively.

While other countries of Europe were compelled to appropriate large sums for military and naval aviation and

Minister Brandenburg, Director of the Air Traffic Department of the German Ministry of Communication.



Looking down on the Brandenburger Gate, the Tiergarten, and the Unter den Linden, the Hub of Berlin.

in addition give subsidies to civil aviation, Germany, having neither army nor navy to support, could concentrate on civil aviation. The natural result has been that the aircraft produced in Germany was not designed with an eye to possible use in war. The German constructors were concerned only with the production of passenger airplanes having a high pay load, conveniences for passengers and efficient commercial operation.

First Air Transport Used During the War

Germany's geographical location makes it practically the hub of European air transport. Until the airplanes of other countries could fly over Germany, the expansion of international air traffic lines was very difficult, if not impossible. The first German air transport was used to carry messages during the War. Military messages and mail were sent from Berlin to Hanover and Cologne and from Riga and Kovno as far as Kiev and Sebastopol. The Deutsche Luftreederei was organized in 1917. Its air transport line from Berlin to Weimar was opened February 4, 1919, and carried important communications to the National Meeting. Many small air transport companies were organized but no semblance of an organized transport system came into existence until 1923. The all-metal plane had been introduced and it is interesting to note that the cabin type Junkers' airplane which was given Permit No. 1 is still in regular service.

In 1919, the International Air Traffic Association was organized at the Hague and today this group formulates the rules for the operation of the international services, subject to the legal restrictions of all countries.

Out of the many air transport undertakings which of course could not operate successfully without government subsidy, two important organizations developed. Early in 1923, the German Aero Lloyd was formed out of many smaller companies. At about the same time the Junkers-Luftverkehr was started. From 1923 until 1925 these two groups developed civil air traffic in Germany with assistance from the Government over an amazing network of air lines. In cooperation with the International Air Traffic Association, connections were made with foreign air transport companies so that through services could be maintained with the capitals of Europe.

The Aero Lloyd was solely a transport enterprise. It was not itself interested in the construction of aircraft and it was not bound down to any one make of plane. Its business was to employ, on its transport lines, the best German airplanes that could be constructed within the limits of the Allied restrictions, and it could take its choice from the products of the whole German aircraft industry. It ran a number of main lines in Germany in connection with other main lines abroad and with provincial lines in Germany. Its guiding principle was cooperation on a sort of pool system. In this way it ran the German section of the international line, London-Amsterdam-Berlin-Moscow, in friendly cooperation with Imperial Airways, Limited, the Dutch Koninklijke Luchtvaart Maatschappij, and (though here the connection was closer) the "Deruluft" (Deutsche-Russische Luftverkehrgesellschaft).

Junkers Aimed at Junkers Markets

The Junkers concern, on the other hand, was not interested solely in air transport. If anything, it was more interested in the construction of the Junkers aircraft. The Junkers air transport company was the offspring of the airplane company, and the whole of the system it controlled was built up around this company. Its mission was to provide markets for Junkers aircraft, quite as much as, if not more than, to develop national and international air traffic. It was a case of serving two masters. The system also extended beyond the frontiers of Germany, and, by the middle of 1924, an attempt was made to amalgamate all its lines under the title "Europa-Union," with a capital of $2,500,000. The Europa-Union included air lines in Austria, Switzerland, Denmark, Sweden, Finland, and Esthonia, as well as in Germany. All

Major Martin Wronsky

Otto Merkel

Dr Erhard Milch

The three directing heads of the Deutsche Luft Hansa air system.

of them had either been founded under the influence of the Junkers concern or had been drawn into its orbit under arrangements which left that influence predominant. Their airplanes came from the Junkers company, their technical development was carried out and their personnel trained by Junkers experts. The whole of the Europa-Union was bound to use only Junkers aircraft, and the Junkers company was to be its administrative center. The system also enabled the Allied restrictions to be evaded to some extent, under foreign flags. The growth of this organization began to arouse some uneasiness in Europe. It began to look like a great air transport monoply in Central and Northern Europe.

The burden of subsidizing two rival companies proved to be economically unsound, and the German State, which had a good deal at stake, as it subsidized the Junkers transport system as well as the rival concern, saw its opportunity to bring about an amalgamation which would cut down expenses, increase efficiency, and definitely divorce construction and transport. The Aero Lloyd had long been in favor of combination in the sphere of transport alone.

After some months of negotiation, the amalgamation was concluded and the Deutsche Luft Hansa was organized on

Weighing a passenger and goods before a flight from Berlin.

Interior of Junkers' three engined eleven passenger plane

January 6, 1926. The new company was headed by three men who had been engaged in the direction of the Aero-Lloyd and Junkers air transport. Herr Otto Merkel was elected Director. He had previously spent many years in the United States and was an expert on shipping. Major Martin Wronsky, formerly associated with Herr Merkel in the management of the Aero-Lloyd, and Dr. Erhard Milch of the Junkers Company were chosen as associate directors.

On April 6, 1926, the Deutsche Luft Hansa opened regular air transport service with 120 airplanes of various types over a system of scheduled air routes of 12,427 mi. Fifty different lines were in operation during the summer season, while during the winter of 1926-27 thirty lines covering 6,214 mi. were flown. In 1927, the Deutsche Luft Hansa has increased its mileage by fifty per cent and is now flying 35,418 mi. every day on regularly scheduled air lines. The

Large hangar facilities at Hamburg.

figures show that 93,000 passengers were carried by the company's planes in 1926, with a total flying mileage of 3,822,250.

Approximately 7,000 lb. of air mail were carried monthly on the national and international Luft Hansa lines. This did not include the huge quantities of newspapers transported daily in special airplanes to different parts of Germany.

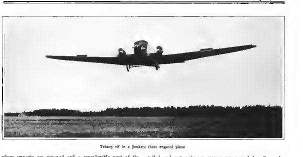
Eighteen European countries will be served daily during 1927 by the Luft Hansa lines. The Deutsche Luft Hansa covers about seventy airports within German boundaries, to which another twenty aerodromes in foreign countries can be added.

The airplane fleet in 1927 of the German Luft Hansa comprises 200 planes and a distance of 46,000 mi. is covered by them every day.

Eighty air transport lines are now in regular operation in Germany. Of these lines, fifteen or more have direct connections with foreign air lines to such commercial centers as London, Amsterdam, Moscow, Paris, Brussels, Vienna, Constantinople, Copenhagen and Stockholm.

The development of the international air freight movement has resulted in the creation of a uniform international air invoice by the International Air Traffic Association which functions in the various countries of Europe. A size limit of 40x30x20 in. has been established for air freight pieces. While individual pieces may way up to 200 kg. and a total shipment may be 1000 kg., it is required that advance notice be given whenever individual freight pieces in excess of 20 kg. or 44 lb. are to be tendered for shipment. Stations for receiving freight have been established in the business centers of cities served by air lines. No special packing is required for air freight. Customs representatives are located at airdromes

The Rhine at Dusseldorf at the gateway to the iron district of Germany



Taking off in a Junkers three engined plane

where imports are received and a considerable part of the time saved by air transport is due to the prompt clearing of airplane freight by custom authorities. Including all administration delays, freight leaving London at 8 a.m. is deliverable in Moscow at 5.30 p.m. the following day, against four full days by water and rail under the most favorable conditions. Freight may be prepaid or sent C.O.D. The regularity of the air transport service is given at 89% in 1925, at 95.3% in 1926.

Insurance of freight may be had to cover loss, theft, damage from defective loading, rain or breakage. Prohibited freight by air includes arms, ammunition, explosives and inflammables.

The development of airports at all the principal cities of Germany has been one of the main activities of German air transport. There is hardly a city of importance in the country that cannot boast of a well-equipped airdrome with complete facilities for handling passengers, goods and mail. At nearly every flying field, a first class restaurant has been installed and not only are passengers provided with meals, but every inducement offered to the public to come to the airports and see the arrival and departure of the planes. The hangars are substantially built and vary in size with the requirements of the field. Ticket offices, waiting rooms, customs bureaus and passport offices are provided, every convenience, even to the point of luxury in some instances, is made available to the air traveling public.

In Berlin, Tempelhof Field is the center of interest to the public as well as to air travelers. It was formerly a drill ground for the German Army. It has been transformed into a model airport and is one of the few flying fields in the world located in the center of a city. Here are to be found not only the most complete aeronautical facilities, but a hotel is to be built which will still further provide a specialized service for the air tourist.

In succeeding articles, a description of German commercial aircraft and a detailed account of the principal air lines will be given.

Model Airport at Essen. Note the pavilion and park for guests.

Guggenheim To Finance Passenger Services

HARRY F. GUGGENHEIM, President of the Daniel Guggenheim Fund for the Promotion of Aeronautics, Inc., authorizes the following:

As a result of the great progress in air transport in the United States, the trustees of the Daniel Guggenheim Fund for the Promotion of Aeronautics have authorized equipment loans for the operation of passenger air lines in the United States. Equipment loans are and have been used extensively in the development of American railroad and street railways and the trustees of the Fund believe the same principles of financing should be applied to air transport.

The equipment loan plan of the Guggenheim Fund will not only provide equipment for the demonstration of performance but will provide a concrete example of aeronautical financing upon which further financing can be developed. The loans will be made only to existing operating companies for the purchase of the most modern, multi-engined planes of maximum safety and comfort so that an actual demonstration of performance and safety will be available as an incentive for further development of passenger air lines in the United States.

Survey to be Made of Routes

Planes bought under the equipment loan provision must be designed to fly should one of the motors be disabled. The route or routes over which the new equipment will be flown must be approved for passenger carrying by the Aeronautical Division of the Department of Commerce, which, through William P. MacCracken, Jr., Assistant Secretary of Commerce for Aeronautics will install on the selected routes the most up-to-date communications and meteorological services.

A survey will be made by the Daniel Guggenheim Fund in cooperation with the Department of Commerce and operators of existing air-mail routes for the purpose of selecting the most favorable routes for undertaking this practical experiment.

The Guggenheim Fund has always emphasized the fact that aviation must progress through the development of commercial flying. The Fund, which has for its primary purpose the promotion of ways and means of securing safety in flying, believes that popular support can be obtained for commercial airlines provided they give continued demonstrations of performance and safety. The equipment loans offered by the Fund are made solely for the purpose of allowing a reputable company further scope in demonstrating the practicability of aircraft in modern everyday life.

Country Best Suited to Passenger Services

Preliminary arrangements for a discussion of the equipment loans were considered at a meeting of representatives of each of the contract airmail services in New York some time ago. It was emphasized at the meeting that Europe has developed her aerial passenger carrying facilities to a high degree, while the United States has specialized in the airmail service.

On the other hand, America, it was pointed out, was better suited to aerial passenger services since distances in this country are greater and the use of airplane would materially reduce the time necessary to travel between the larger cities. The operators were unanimous in approving the equipment loan idea.

Passenger airlines in Europe have been aided very greatly by state financial assistance. In the United States, however, air transportation has been developed primarily without direct government subsidy, as exemplified in the airmail service, all of the lines of which have been turned over to private operators.

Multi-engined passenger carrying planes embodying the latest designs for comfort and safety are expensive, both to buy and to operate. Lack of financial support has held back the development of this phase of aeronautics in the United States, principally because the immediate response from traffic was not sufficient to allow operating companies to spend a large amount of money for equipment, the performance of which would draw further traffic.

Many Air Officials Present

Among those who attended the preliminary meeting at the offices of the Guggenheim Fund to discuss the equipment loans were: Secretary MacCracken, William B. Robertson and James D. Livingston of the Robertson Aircraft Corp.; L. H. Brittain of the Northwest Airways, Harris M. Hanshue of the Western Air Express, Walter T. Varney of the Varney Air Service, Boise, Idaho, V. C. Gorst of the Pacific Air Transport, George P. Tidmarsh of the Boeing Airplane Co.; C. M. Keys, Carl B. Fritsche and Col. Paul Henderson of the National Air Transport, C. H. Biddlecombe of the Colonial Air Transport; William B. Stout and Stanley Knauss of the Stout Air Service, William B. Mayo, Chief Engineer of the Ford Motor Co.; Anthony Joseph of the Colorado Airways; Maj. Reed Chambers of the Florida Airways; Clifford S. Ball of Pittsburgh, G. S. Childs of the Pitcairn Co., and Charles Whrightson of the Varney Co.

New Shock Absorber for Landing Gears

The Gruss Air Spring Co. of America, announces that it is manufacturing the Gruss Aero Strut for use as the shock absorbing means on the landing gear for all weights of airplanes.

The company states that this type of shock absorbing and anti-rebound unit incorporated in the land type gear is capable of absorbing shock loads up to several times the weight of the plane, without precipitable rebound. The unit is in full effect when taxiing, having a range of deflection from eight to ten inches and when inflated to its proper position is carried about two-thirds the range of its deflection. Consequently the air within the device is at its very lowest pressure for the weight of the plane and the load carried, the air pressure in the device being governed only by the weight of the plane which naturally is always susceptible to the flexibility under that particular weight. If the weight should vary, which it will, the air within the device will expand to a point just sufficient to sustain the changed weight of the plane or load, consequently giving a uniform flexibility at all times regardless of the weight carried or the force of impact when landing, eliminating all rebound and making it possible to effect much safer and shorter landings.

Fifteen New Types at R. A. F. Display

Fifteen new types of British aircraft were shown at the Royal Air Force Display held in London on July 2, 1927. The planes taxied along the line of enclosures, took off and flew round. No less than eight of these planes were fitted with the "Bristol" Jupiter engine, and one with the "Bristol" Cherub. The planes, engines, and uses are:

Bristol Bulldog, Bristol Jupiter, day and night fighter; Gloster Gamecock, Bristol Jupiter, winner of the Sassoon Cup; Short Chamois, Bristol Jupiter, Army cooperation; Handley Page Hinaidi, two Jupiters, night bomber; Gloster Goring, Bristol Jupiter, day bomber; Boulton & Paul Sidestrand, two Jupiters, day bomber; Vickers Valiant, Bristol Jupiter, General purposes; Westland Wapiti, Bristol Jupiter, general purposes; Pterodactyl, Bristol Cherub, aerodynamic research.

Tail Spins and Flat Spins

With Special Reference to Accidents Due to Non-Recovery From the Latter

By B. V. KORVIN -KROUKOVSKY

WE FEEL rather sure that airplanes are quite safe. Accidents happen very seldom We have excellent records of the Air Mail, flying many miles without mishaps of any kind, and we have equally good records of passenger transport on a large number of air lines in Europe. Only once in a while do we hear of an accident due to collision in training, which is easily explained by the requirements of the training for air combat and formation flying The time of mysterious, unexplicable accidents seems to have passed.

Occasionally, however, there appears a series of accidents only partially explainable, which reminds the engineers that there is still something left to be investigated and to be learned in applied aerodynamics Recently there have been several accidents on different airplanes due to non recovery from a flat spin. The tail spin is a rather common manoeuvre, known for a long time, and not infrequently used in air combat, as well as in demonstration flying When carried out at a sufficient altitude, it contains no elements of danger Its occurence at a low altitude, however, particularly immediately after take off, has been the cause of about 90 per cent of the fatal accidents There seems to exist, also, a rather vicious variety of this manoeuvre, from which recovery was found very difficult, if not impossible This variety became known under the name of *"Flat Spin."*

Study of Flat Spin Difficult

The study of such a thing as the *Flat Spin* is rather difficult because of the dangers connected with experimenting with it, and, consequently, a very limited amount of experimental data is on hand. There exists a certain amount of wind tunnel research, but little data to connect it with full scale airplanes It is natural, also, that private concerns, whose airplanes develop such undesirable characteristics, do not publish any data, but are rather trying to avoid publicity. It is only from government reports and investigations that a certain amount of data is available. The reports of the British Advisory Committee for Aeronautics contain considerable amount of data on normal spins and on autorotation They also give wind tunnel data on two airplanes—*Bantam* and *Springbok*, which refused to come out of a tail spin in flying tests. The Bureau of Construction and Repair Technical Note No. 164 gives the results of a number of spinning tests on a Naval training airplane, which on several occasions refused to come out of a tail spin. In May 30th issue of AVIATION some data is given on spinning of two Army observation airplanes, which were also deficient in this respect With this material on hand we will try to investigate the peculiar properties of tail spins in general, and of flat spinning in particular

The normal tail spin is usually started by stalling the airplane, shutting off the engine, and pulling the control stick back and to one side. The rudder is also turned to the same side, as the control stick The nose of the airplane is first observed to rise up, the machine rolls to the side, to which the control stick is moved, turning simultaneously in the same direction As the rolling and turning develops, the nose drops down Very soon quite regular spinning motion is established and the pilot feels as though he were sliding down along the thread of a deep screw This steady, although rapid, spiral descent persists as long as the pilot holds the controls in the position described above As soon as he brings the controls to neutral position, the spinning stops, and the machine is found to be in a vertical nose dive, from which it is easily leveled out by the elevators. The ceasing of rotation and leveling out of dive occupy a definite period of time, during which a certain altitude is lost. As mentioned before, the normal tail spin is dangerous only when the altitude needed for recovery is lacking

The flat spin starts in the same way as a normal spin. As a matter of fact, it is a normal spin at the beginning As it progresses, however, the speed of rotation increases and the nose of the machine rises up to a more horizontal position. When this state is reached, it is very difficult to bring the machine out It may be interesting to cite here the description of a flat spin sent to us by Mr N B Mamer of Spokane, Wash, who found himself in a flat spin together with two passengers while trying out a rather well known commercial airplane. The airplane did not come out of a spin and was crashed, fortunately without injuries to its occupants.

Mr Mamer writes " Having the good safe altitude of 2000 ft., and desiring myself to see how the ship would act in a spin, I did a wing-over into a spin with power on, stick all the way back and rudder hard over Without any hesitation whatever the ship started spinning Feeling elated over this final evidence of manoeuverability and having made two spins I decided to come out. The motor was throttled as soon as the ship started spinning Applying full opposite rudder, stick forward and away from the spin I moved the throttle wide open to get a quicker bite on the tail surfaces. To my surprise the ship kept right on spinning the

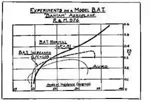


Fig 1

nose gradually working its way up At first I did not mind, assuming it was merely one of those slow recovering ships with which I had had previous experiance But before, the nose always acted differently, instead of working its way up, it moved in the other direction After several more turns with power full on, the fuselage became practically horizontal the ship spinning faster and faster Throttling the motor the nose seemed to drop slightly and the whirling motion moderated somewhat but no tendency to come out of the spin resulted By this time the ship settled into a steady rapid spin with the fuselage absolutely horizontal, the center of rotation feeling as if it were between the front and rear cockpit. Again I tried to right the ship with full throttle leaving the motor wide for about four turns but the only effect was more rapid spinning Taking my hands and feet off the controls entirely for several turns did not produce anything Once more I tried power but the propeller blast evidentally was not forceful enough to reach the tail due to

the terrific whirling motion Every combination of control was tried but without result. It was estimated by observers on the ground the ship made from 18 to 20 turns on its downward journey."

The basic cause of the tail spin is stall and autorotation Under *autorotation* is known the property of a lifting surface to spin about its fore-and-aft center line when subjected to the action of the wind at a large angle of incidence. When the lift coefficient of a wing is plotted against the angle of incidence, it is found that lift increases only to a certain limit After reaching a certain angle known as the *angle of maximum lift* or *burble point*, the lift of the wing ceases to increase and actually begins to diminish, i.e. further increase of the angle of incidence causes *decrease* of the lift. Let us imagine now an airplane stalled until its angle of incidence is considerably larger than angle of maximum lift, say 25 deg Let us imagine now that action of the controls makes this airplane roll to the left If we consider a cer-

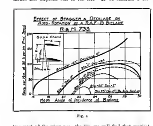


Fig. 2

tain part of the wing near the tip, we will find that vertical velocity of this part, due to rolling, is added geometrically to the horizontal velocity of the wind In case of the left hand wing moving downwards, the resultant of these two velocities acts at a larger angle to the wing chord than the original wind velocity I.e., the angle of incidence of this wing is *increased*. This immediately causes *decrease* of the lift on the left hand wing. In a similar way the right hand wing moving upward is found to be at the smaller angle of incidence, and its lift is found to be increased. Thus, we find decrease of the lift on the wing moving dawnward and increase of it on the wing moving upward. The presence of such unbalanced lift forces evidently causes the wing to continue and even to accelerate its rolling in the same direction. *The wing set in a wind at an angle of incidence larger than the angle of maximum lift will rotate automatically if motion is started in either right or left hand direction.* For the more detailed analysis of the autorotation and of the tail spin the reader is referred to the article on "Stability and Controllability of Airplanes" in "AVIATION" for May 4, 18 and 25, 1925, pages Nos 488, 546 and 574.

Definite Velocity of Autorotation

Both laboratory and actual flying experiments show that for each wing there is a definite velocity of autorotation This velocity is directly proportional to the wind speed and inversely proportional to the span of the wing It varies also with the angle of incidence In laboratory reports the velocity of autorotation is usually described by non dimensional coefficient ps/V, where p is velocity of rotation in radians per second; s is semi span in feet, and V is wind speed in feet per second The autorotation becomes possible only at a certain angle of incidence. As the angle of incidence is increased, the velocity of autorotation increases also up to a certain maximum, after which it diminishes and ceases altogether at a certain larger angle Thus, the experiments on the model of Avro training biplane, results of which are shown on Fig 1, disclose that autorotation starts at an angle of 18 deg, reaches its maximum velocity at 28 deg, and ceases at 32 deg At maximum velocity of autorotation the coefficient ps/V is found to be 0.28 *The range of angles, at which the autorotation is possible, and the maximum velocity of it are two factors of prime importance in the study of a tail spin.* We will see later that the so-called flat spin occurs only when the velocity of autorotation is abnormally high.

Study Divided in Two Parts

The following study can be divided in two distinct parts: The first part deals with the shape and arrangement of the wings affecting the speed and range of autorotation; the second part will deal with the effect the autorotation produces on the balance and controllability of an airplane

The laboratory experiments show that fuselage and the tail surfaces have very little effect on autorotation; practically everything depends on such characteristics of the wings as gap to chord ratio, stagger, decalage and washout.

On Fig 1 are shown the results of the experiments on autorotation of model B A. T *Bantam* airplane, which was found difficult to get out of a tail spin. It was found that with no stagger and gap to chord ratio of 0.81, the autorotation had lower limit of 20 deg., but had no upper limit. The velocity of autorotation was also found to be very high. The reader will note that at 37 deg angle of incidence the velocity of autorotation of this model was about twice that of the Avro. When the gap to chord ratio on the model was increased to 1.03, the autorotation ceased at about 34 deg and its velocity although still rather high, had a definite maximum value. These experiments show that in case of an unstaggered biplane *the velocity of autorotation increases, as the gap is decreased.*

The experiments on autorotation of the staggered biplane of R.A F.-15 wing section with gap to chord ratio of one are shown in Fig 2 The aerofoils were 3" by 18" in size The reader will observe that in case of no stagger and no decalage, the range of autorotation was from 19 to 30 deg. of the angle of incidence. Maximum speed of the autorotation was found to be 100 r.p.m When the wings were rearranged with negative stagger of 25 deg, i.e when lower wing was ahead of the upper one, the autorotation started earlier, at 16 deg, and had no upper limit. Its velocity was considerably higher than in case of the unstaggered biplane When the wings were arranged with positive stagger of 25 deg the autorotation was found to be impossible. *Positive stagger of sufficient magnitude prevents the autorotation while negative stagger increases its violence*

Bristol Fighter Experiments

Decalage was also found to have great effect on autorotation, particularly in case of positive stagger. As a rule *the range and velocity of autorotation increase with the angle of incidence of the lower wing.* The autorotation was found possible even in case of the staggered biplane, if the angle of incidence of the lower wing was 2 deg larger than that of the upper wing

On Fig. 3 are shown the results of experiments on the model of Bristol Fighter with different rigging of the ailerons When the ailerons were rigged in standard way, i.e. so that they were flush with the wing, the range of autorotation was from 19 to 32 deg and its maximum velocity $ps/V = 0.3$ Rigging all the ailerons to be at an angle of 10 deg below the wing caused considerable increase of range and of velocity of autorotation. On the other hand, rigging of ailerons at negative angle reduced the range, and velocity of autorotation The Fig 3 shows that when the ailerons were rigged up 14.9 deg the autorotation became practically impossible Nobody is expected, of course, to rig the ailerons as much as 10 or 15 deg up to prevent the autorotation, but

the experiments are indicative of what can be expected in case of washout of the wing tips. Rigging the ailerons up is equivalent aerodynamically to making washout. We can conclude that *washout of the wing tips has great effect on autorotation, and can be used for prevention of the tail spin* It is interesting to note in this connection that aerofoil theory shows the washout of as much as 9 deg. to be beneficial for reduction of drag at climbing angles of incidence.

Thus we see that several means are available for controlling the range and the velocity of autorotation and of securing any desired degree of spinning ability or inability in an airplane. Increase of the gap to chord ratio, increase of the stagger, reduction of the angle of incidence of the lower wing and washout of the wing tips tend to slow down or eliminate the autorotation. Inversely, decrease of the gap to chord ratio, negative stagger, increase of the angle of incidence of the lower wing as compared to the upper one and wash-in tend to aggravate the violence of autorotation, and hence of the tail spin

Radius of Turn Less than Span

Now, after considering the characteristics affecting autorotation, we will turn our attention to the effect the autorotation produces on the control and balance of an airplane. We will assume that in normal flight the airplane was balanced and the controls were in neutral position. In order to stall an airplane with a fair degree of stability, and in order to keep it at the angle of incidence of 20 to 30 deg., at which the spin is possible, the control stick usually has to be pulled all the way back. Release of the stick to neutral position, or pushing it forward, must result immediately in decrease of the angle of incidence to the value at which the autorotation is no longer possible. Does the autorotation itself make any change in the balance, and tends to establish the tail spin as stable condition? Apparently it does.

The observations made on the tail spins (R. and M. No. 618) of actual airplanes in England show that often the radius of the turn is less than span of the airplane, and that there is very little sideslipping or skidding. The experiments made at McCook Field (AVIATION May 30, 1927) also corroborate this later statement, as the pilot reported that no tendency was observed towards being thrown from side to side of the cockpit. The movement of an airplane is then about as shown on Fig. 4. The longitudinal axis of an air-

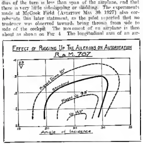


Fig. 3

plane is tangent to the curved flight path at the center of gravity. There is no sideslipping or skidding as far as the wings are concerned, yet the tail meets the air as though the airplane was skidding. The angle of yaw at which the tail surfaces meet the air stream is evidently larger, when the radius of the turn is smaller. In extreme cases this angle of yaw may be as large as 40 degrees.

The wind tunnel experiments made on the models of several airplanes show that effect of the yaw on balance is to increase the pitching moment algebraically, i.e. to make it more positive. The results of one of these tests are shown on Fig. 5. With no yaw the model biplane was practically in balance at the angle of incidence of 8 deg., and had large diving moment at the angle of 20 deg., tending to reduce this angle. When the model was yawed 32 degrees it was found

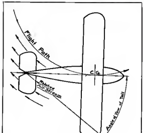


Fig. 4

to be in balance at 20 deg. angle of incidence. Further experiments made separately on the wings showed that their contribution to this effect is very small, and that change of pitching moment is almost entirely due to tail plane. Thus, in a tail spin *the empennage meeting the air at large angle of yaw will produce considerable stalling moment.* This moment tends to hold an airplane at large angle of incidence favorable for continuation of the autorotation. If the wing characteristics are such that speed of autorotation is low, the radius of the spin will be large, the angle of yaw of the tail will be small, and the stalling effect of the tail plane will be negligible.

Dynamic Effect Due to Centrifugal Force

If on the other hand the wing arrangement of an airplane is such as to cause the autorotation of high speed, the radius of the turn will be small, the angle of yaw of the tail plane will be very large and so will be the change of the pitching moment. The airplane which required full movement of the elevator in order to bring its angle of incidence up to one needed for autorotation, may remain at that angle even with the elevators released, if the speed of autorotation is sufficiently high.

Besides the aerodynamic effect of autorotation described above, there is dynamic effect due to centrifugal force of the masses. On Fig. 6 an airplane is shown flying at an angle of incidence α in a tail spin and rotating about the flight path with angular velocity p. It is evident from the sketch that centrifugal forces due to rotation acting on the masses m_1 m_2 etc. located along the axis of the airplane, tend to make this axis perpendicular to the axis of rotation. The stalling moment ΔM due to the mass m located at the distance x from the center of gravity on fore-and-aft axis of the airplane is:

$$\Delta M = m \times \sin\alpha\ p \times x \cos\alpha = \tfrac{1}{2} m\ x^2\ p^2\ \sin 2\alpha$$

In a similar way for any mass m located at the distance r on the Z axis of the airplane we get:

$$\Delta M = -\tfrac{1}{2}\ m\ r^2\ p^2\ \sin 2\alpha$$

or, integrating to get the pitching moment due to all masses, we get.

(1) $M = \tfrac{1}{2}\,(I_z - I_x)\ p^2 \sin 2\alpha$

where I_z is the moment of inertia about vertical axis, and I_x is the moment of inertia about longitudinal axis of the airplane. As I_z is always much larger than I_x, the moment due to centrifugal force in autorotation is always positive, i.e. stalling.

In R. and M. No. 976 the following figures are given for the *Bantam* airplane which was found very difficult to bring out of tail spin:

$I_z - I_x = 317$ slugs $\times$ ft²

p = assumed to be 4 radians per second

α = assumed to be 30 deg.

Then we have:

$M = 0.5 \times 317 \times 4^2 \times 0.857 = 2180$ LBS. FT

Assuming the speed of the *Bantam* in a tail spin to be about 70 m.p.h., *this moment is found to be about equal to the total elevator control available at 30 degrees angle of incidence*

We want to call the reader's attention to the fact that stalling moment due to centrifugal force or *dynamic effect of autorotation* is proportional to the *square* of the rotational speed. The angle of incidence α also increases with the speed of rotation and so does Sin 2α, which reaches its maximum value at 45 deg. Like the yaw effect of the tail plane discussed before, the dynamic effect is negligible if the speed of autorotation is low, and becomes equal or exceeds the power of the elevators if the velocity of autorotation is sufficiently high.

Rudder Effect Improved by the Yaw

The laboratory experiments on autorotation indicate that presence of the empennage and the shape of the fuselage have very little effect on autorotation. In these experiments, however, the movements of the model are limited to the roll and do not include the yaw. The examination of the Fig. 4 shows that yaw of the tail is necessary characteristic of a tail spin. This being the case, it is evident that extra large *vertical tail area* will resist the yaw, and hence can slow indirectly the autorotation. This is well confirmed by experience with spinning of full sized airplanes. In particular the rudder represents the most powerful of all means for controlling the airplane at the angles of incidence above stalling. Even in the tail spin it can be used for quicker recovery, and in many airplanes it is possible to reverse the direction of the tail spin by quick action of the rudder.

Unlike the other controls, the effectiveness of the rudder is not diminished by the yaw, in fact it is considerably improved. It is very much diminished, however, by increase of the angle of incidence, probably because of the shielding effect of the stabilizer. The Table I taken from Rep. and Memo. No. 976 shows the yawing moment due to rudder turned 20 deg. at different angles of incidence and of yaw on the model of *Bantam* airplane. It will be observed that at moderately large angle of incidence, as 20 deg., the loss of the rudder efficiency due to angle of incidence is largely balanced by the gain due to yaw. This condition corresponds to the normal spin, when neither angle of incidence, nor yaw of the tail became excessive. In case of the very fast autorotation, found in a flat spin, the average angle of incidence may reach as high values as 40 deg., which results in almost complete loss of the rudder control.

Thus the rudder control is indirectly affected by autorotative characteristics of the wings. In the machine like *Avro 504*, or like *Bristol Fighter*, the curves for which are shown on Fig. 3, the autorotation is possible only at the angles of incidence from 20 to 32 degrees, at which angles the rudder is still effective and can be used to assist the recovery. Any farther increase of the angle of incidence of these airplanes makes the autorotation, and hence the tail spin impossible. In case of the machine like *Bantam*, shown on Fig. 1, there is

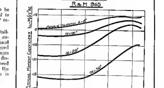


Fig. 5

apparently no limit to the angle of incidence at which the autorotation is possible, and when this angle reaches sufficiently high value in very fast spin, the rudder control practically disappears.

We said repeatedly that autorotation is the cause of the tail spin, and that violence of the tail spin depends on the speed and range of autorotation. We must not forget, however, that autorotation itself is the result of the stall, and cannot occur unless the airplane is stalled, and its angle of incidence increased to something like 25 deg. If the stability characteristics of an airplane are such as to make the stall and increase of the angle of incidence to 25 degrees or more very easy, it will spin easily or not depending on autorotative characteristics of the wings. If the stability characteristics are such as to make stall difficult, and increase of the angle of incidence to 25 deg. impossible, it will be found impossible to make it spin, regardless of the autorotative characteristics of the wings. Thus the fore-and-aft stability and balance have very important bearing on spinning characteristics of an airplane.

Two airplanes may be balanced equally well in normal flight, yet will show different characteristics when stalled. The airplane of which the center of gravity is located well forward of the center of pressure is balanced in normal flight by down pressure of air on the stabilizer. This down pressure depends on the speed of the machine and on the downwash of the wings. When the wing burbles in stall the angle

TABLE I

Yawing Moments due to Rudder in lbs. ft. on Model of *Bantam* Airplane.
Ailerons Central. +20° Rudder

Angle of Incidence Uncorrected °	Corrected °	Elevator Angle °	Angle of Yaw —30°	—20°	—10°	0°	10°	20°	30°
14.0	[illegible]	—30	—0.209	—0.269	—0.101	—0.102	—0.319	—0.232	—0.280
20.[illegible]	21.1	—20	—0.216	—0.176	—0.107	—0.1[illegible]7	—0.175	—0.226	—0.281
24.[illegible]	20.1	—20	—0.187	—0.0[illegible]	—0.080	—0.079	—0.042	—0.063	—0.221
28.[illegible]	20.1	—30	—0.07[illegible]	—0.000	—0.080	—0.073	—0.080	—0.084	—0.137
40.[illegible]	41.0	—20	—0.030	—0.010	—0.014	—0.001	—0.001	—0.011	—0.007

of downwash is decreased, and so is decreased the down pressure on tail. The balance is destroyed, the machine drops its nose and dives until flying speed is regained. Only by very powerful action of the elevators can such a machine be held at large angle of incidence required for autorotation and spinning. On the other hand, the airplane, of which the center of gravity is located to the rear of the center of pressure, is balanced in normal flight by lift of the stabilizer. Burbling of the wing and reduction of the angle of downwash may cause burbling of the stabilizer as well, as was explained in detail in the article "On the Control of Airplanes at Low Speed" in AVIATION for June 21, 1926. Such an airplane will be found to remain in the stall without any tendency to recover, and in fact may increase its angle of incidence. Needless to say, such an airplane will spin even if the controls are released to neutral position.

Consideration of Results

So much for the theory. Let us consider now the results of the experiments made on spinning of the actual airplanes. Table II was compiled from the record of forty trial spins found in the Technical Note No. 164. The reader will note that in one test with loading such as to require —3 degrees stabilizer setting for balance in normal flight, the tail spin was found impossible. As the load in rear cockpit was increased, requiring less and less negative stabilizer setting, the flat spin was obtained easier, and the recovery from it was more and more difficult. The airplane under consideration was found to be at its worse when equipped as landplane with pilot and passenger. In this case its center of gravity was located at about 35 per cent of the chord, the flat spin was easily obtained, and the recovery from it was difficult and slow. The airplane was found to be at its best when equipped as seaplane with no load in rear cockpit. In this case its center of gravity was located at about 24 per cent of the chord, and flat spin could not be obtained under any conditions.

The B.A.T. *Bantam* often mentioned in this report had its center of gravity at 42.5 per cent of the chord. It usually could be just brought out of a spin by vigorous use of the controls. Two accidents with this type of the airplane due to non-recovery from a spin are on record. The *Springbok* airplane, described in R. and M. No. 955, had its center of gravity at 38 per cent of the mean chord. On one occasion when it was spun, it did not show any near approach to recovery.

Both airplanes mentioned in the article "Spinning Tests on Observation Planes—McCook Field" in AVIATION for May 30, 1927, recovered quickly from tail spin, when balanced at 20 per cent of the chord, using about 600 feet of altitude for recovery. Under full load condition, with the balance at 35 per cent of the chord, the recovery was slower. 1000 feet of altitude were lost and the control forces were greater. At the balance location at about 5 per cent farther to the rear of the full military load position, both airplanes stopped spinning so slowly and the control forces were so high, that they were considered unsatisfactory.

Thus, both theoretical considerations and practical experience show that *tail spin occurs easier and becomes more dangerous the farther aft is the center of gravity located*. Generally speaking location of the center of gravity from 25 to 30 per cent of the mean aerodynamic chord will allow easy recovery, while with the center of gravity located farther to the rear than 30 per cent of the chord one can often get in serious trouble. As a matter of fact it is seldom that any tail spin at all can be obtained with the center of gravity located as far forward as 25 per cent of the chord.

We have considered the characteristics of the wing arrangement affecting the speed and the range of autorotation. We have considered the effect the autorotation has on the balance and on the control of an airplane. We have considered the disappearance of the rudder control at large angles of incidence, and the effect of location of the center of gravity. We have found that stagger, gap to chord ratio, decalage

DYNAMIC EFFECT OF AUTOROTATION
R & M. 976

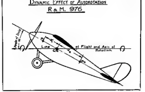


Fig 6

and washout have great influence on the speed and range of autorotation, and give us the means of controlling it. We have found that the speed of autorotation is responsible for generation of two stalling moments, due to action of the tail plans and due to inertia of the masses, which are capable of holding the machine at very large angle of incidence in a flat spin, even against action of the elevators. We have found that large increase of the angle of incidence in a very fast spin leads to considerable weakening, and often complete disappearance of the rudder control, depriving the pilot of this last means of bringing the machine out of spin. We have remembered, rather evident fact, that location of the center of gravity beyond 30 per cent of the chord makes it easier for the machine to reach such high angles of incidence as are required for spinning, and makes it more natural for it to stay in balance at these angles, making recovery more difficult. Let us consider now how the above principles fit into the description of the tail spin given at the beginning of this article, and what is the difference between the normal and flat spin.

Let us consider perfectly normal and well balanced airplane with its center of gravity located at 30 per cent of the chord, and with such an arrangement of the wings, that coefficient ps/V during autorotation does not exceed 0.3, and the range of autorotation is limited by the angle of incidence of 33 degrees. The airplane so balanced will readily respond to the controls, and will stall when made to do so by the pilot. As the angle of incidence of some 25 degrees is reached and the initial rotation is given by the action of the rudder and ailerons, the autorotation establishes itself and the normal tail spin results. As the velocity of the rotation p is not large, and the angle of incidence α is moderate, the

TABLE II
Effect of Balance on Spinning as Shown by Flight Tests

Load in rear cockpit in lbs average	Stabilizer setting	Number of Tests	Percentage of Number of Tests: Tail Spin could not be obtained	Flat Spin obtained with difficulty	Flat Spin obtained easily	Number of turns required for recovery
100	—3°	1	100	0	0	1 0
0	—2½°	9	56	44	0	1.7
75	—½°	7	14	43	43	6.0
150	0°	12	8	0	92	2 0
160	+½°	11	3	0	81	

stalling moment M, determined by formula (1), is not important whatever is the distribution of the masses in the airplane. The angle of yaw of the tail shown on Fig 4 is also moderate, and the stalling moment due to it hardly exists. Our airplane is held at an angle of incidence needed for spin almost entirely by the power of the elevators, and release of these causes immediate reduction of the angle of incidence and ceasing of autorotation, and hence stopping of the tail spin. As the average angle of incidence is between 25 and 30 degrees, the rudder retains its effectiveness and can be used, if desired, to hasten the recovery. The angle of incidence *cannot exceed 33 degree in this spin*, as the autorotation is impossible above this angle.

We find different picture in case of an airplane with the center of gravity located at 40 per cent of the chord, and with wing arrangement such as to have no limit neither to speed, nor to range of the autorotation, as for instance was the case with *Bantam* airplane with gap to chord ratio of 0.81.

Increase of Incidence Increases Rotation

When such an airplane is stalled, it gradually takes up an increasing rate of spin, while the angle of incidence "builds up" under action of two powerful stalling moments due to inertia of the masses and due to skidding of the tail. Increase of the angle of incidence in this case causes increase of rate of rotation, which in turn increases stalling moment and results in farther increase of the angle of incidence. In this way very high speed of rotation, and very large angle of incidence can be reached. Under such conditions, when the stick is put forward for recovery from spin, instead of the machine coming out at once, it will merely take up a different attitude, still however within spinning range of incidence. It is interesting to note that in all cases of the *flat spin*, the machine went into a spin slowly and, gradually over the period of several turns, settled down to a fast spin at very large angle of incidence.

The *flat spin* appears to be the result of backward location of the center of gravity (beyond 30 per cent of the chord) combined with *wing arrangement capable of very high speed and wide range of autorotation*. In normal airplanes with normal degree of manoeuverability such as *Avro 504* and *Bristol Fighter* the speed of the autorotation does not exceed ps/V=0.3 and the range is limited to the angle of incidence of 33 degrees. In such a case neither position of the center of gravity, nor distribution of the masses have much importance. If the wing arrangement of an airplane is such as to allow very high speed of autorotation such as ps/V=0.6 at very large angle of incidence, the question of recovery from a spin *depends entirely on the position of the center of gravity and on the distribution of the masses*.

Cleveland C. of C. Sends Plane to Jubilee

Cleveland made a bid for leadership in aeronautics June 27 when the Cleveland Chamber of Commerce backed the sending of a Glenn L. Martin plane, "The City of Cleveland", to the International Aviation Peace Jubilee at Santa Ana, Cal., July 2-9. The city did this to show its pride in the Glenn L. Martin Co. plant, the largest airplane factory in the United States, if not in the world, and in its airport, where the air mail and commercial planes have been landing for over two years.

"The City of Cleveland" reached Santa Ana in three days with no night flying and official stops at Chicago., Ill., Omaha Neb.; Cheyenne, Wyo., Salt Lake City, Utah; Las Vegas, Nev., and Los Angeles, Cal., where messages of good will were delivered from the mayor of Cleveland, president of the Chamber of Commerce, and chairman of the chamber's committee on airplane interests to corresponding officials in the various cities by Clifford Gildersleeve, representative of the Cleveland Chamber of Commerce on this tour.

The Martin biplane which made the trip has an honorable record of a perfect score in the Ford Reliability Tour two years ago, and of taking second place in the races for commercial planes at Dayton three years ago. It was piloted on this trip by Kenneth R. Cole who has been with the Martin company for two years.

The Glenn L. Martin Co. plant occupies about 75 acres on the outskirts of Cleveland, employing about 1,000 men representing 55 skilled crafts. It has an output of 5 huge bombing planes a week, practically all of which are taken by the United States Navy.

Kenneth R. Cole pilot and Clifford Gildersleeve passenger representative of the Clevland Chamber of Commerce

The scene of the Jubilee happens to be the very spot where Martin built his first plane and learned to fly in the days when the Wright brothers were experimenting with the construction of planes at Dayton.

Cleveland's airport is the largest municipally owned airport in the world, covering 1,000 acres. It includes a main field on which is the eastern division headquarters of the transcontinental day and night mail route, mail and express routes to Detroit, Youngstown, Pittsburgh, commercial air lines, and a flying school. The Ohio National Guard unit occupies the second field. The air mail equipment and buildings at the airport, recently transferred to the city by the government are estimated at $100,000. They include three hangar buildings, one office building, one beacon light on a 53-foot tower, one flood light, one 25 kw generator, one Kohler plant and boundary lights.

Seek to Extend Air Mail Line to Mexico

Postmaster General New recently addressed a letter to the Postmaster General of Mexico advising him of the proposal of this government to inaugurate in the near future a contract air mail service between San Antonio and Dallas, Tex., connecting with the through route to Chicago and New York, and asking whether the Mexican administration is contemplating the establishment of air mail service between any of its cities and the border. Postmaster General New indicated that he would withhold decision on the extension of the air mail route south of San Antonio—whether it should go to Brownsville or Laredo—until it is determined which of these cities, or other points on the border, would be most convenient to the Mexican government for a later connection with any Mexican air service that might be established to the border.

N.A.T. to Take Over Mail Route by Sept. 1

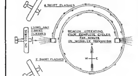
According to a recent communication received by Postmaster General New from the officials of the National Air Transport, Inc., contractors of the New York-Chicago air mail route, the operation of that line will not be assumed until Aug. 15 and possibly not until Sept. 1, but not later than that date. The Post Office Department will continue to operate the service until the contracting company is ready to take it over.

B. B. T. Corp. Develops New Beacon

Has Flash of Distinctive Character and is Mounted on a Reversing Mechanism Which Turns it Through an Arc of 540 Deg. and Back Every Fifteen Seconds

As A beacon is of great value when a pilot is off his course the B.B.T. Corporation of America has developed a beacon flash of distinctive character. It is called the "Wobbler" and is the result of a year of experimentation. Two of the advantages claimed over the ordinary rotating beacon are that it has a flash of longer duration when the pilot is on the course and that the direction is indicated to him when he is on either side of the course.

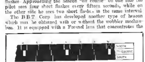
The unit consists of a searchlight type of beacon mounted on a reversing mechanism which turns the beacon through an arc of 540 deg. and back every fifteen seconds. The reversal



Illustrating the rotation of the Wobbler beacon on an east and west course

of the rotation takes place when the beam of light is "on course", either in one direction or the other. When the pilot is on the course this stop and reversal gives a long flash of about one second in duration, with two short intermediate flashes. Approaching the beacon "off course" on one side the pilot sees four short flashes every fifteen seconds, while on the other side he sees two short flashes in the same interval.

The B.B.T. Corp. has developed another type of beacon which may be obtained with or without the wobbler mechanism. It is equipped with a Fresnel lens that concentrates the



The timing and intervals between flashes "on course" and on each side when "off course" compared with the present type of beacon.

beam of light into a solid cylinder, eliminating all stray light. A patented feature in this light consists of two small slits or openings, one vertically across the top of the drum and the other transversely across the top of the drum. Through these slits is projected a light beam less intense than the main cylindrical beam but nevertheless extremely useful. The supplementary light through these slits makes the beacon visible from above.

The new B.B.T. flashing beacon is another recent development. There are many objections to any form of rotating beacons due to the large blind area. The B.B.T. flashing beacon has no blind area and is visible over 360 deg. to the zenith. This beacon, which has quite a low initial cost, uses a specially hand cut, hand ground, light house lens in an all glass cylindrical housing with a spherical ventilated top. A 1000 or 1500 watt lamp is used to provide a visibility range of 20 to 25 mi.


The B.B.T. flashing beacon and "Wobbler" beacon.

The beacon was designed for use as a flashing beacon with a light of distinctive character. By giving various beacons each an individual signal letter a system may be worked out similar to that used by the U. S. Lighthouse Bureau in providing distinctive lights along our shores.

Former Senator Wadsworth Joins C.A.T.

Major General John F. O'Ryan, president of Colonial Air Transport, Inc., announced recently that former Senator James W. Wadsworth of New York had accepted membership on the Board of Directors of the Colonial Western Airways, Inc. Mr. Wadsworth will be elected at the next meeting of the Board.

The Colonial Western Airways has been organized to operate two air routes, carrying passengers and express, between New York and Montreal by way of Schenectady, and between Boston and Cleveland by way of Schenectady and Buffalo, with stops at the larger cities along the routes. At Montreal connections will be made with the Canadian Airways and at New York City (Hadley Field) with the Pitcairn Corp., which shortly will commence operation between New York and Atlanta, Ga. At the same time this company will also tie in with the National Air Transport Co., which is shortly to commence operation of the Government route between Hadley Field and Chicago. At Buffalo the Colonial Western Airways will tie in with the operation of the Ford Company to London, Canada, Detroit, and Chicago. At Cleveland the Mohawk Valley route will tie with the National Air Transport Co. to Chicago and points south as far as Dallas, Texas, and out of Chicago through other companies to the Pacific Coast.

This announcement was made on the anniversary of the inauguration by the Colonial Air Transport Co. of the commencement of its operation between Boston and New York by way of Hartford, Conn.

Aeronautics Trade Commissioner Appointed

The appointment of James D. Summers of Los Angeles as Aeronautic Trade Commissioner has been announced by the Department of Commerce. This is the first appointment in this field and indicates the intention of the department to actively assist American manufacturers of aircraft and equipment to market their products abroad. The new trade commissioner will represent both the Bureau of Foreign and Domestic Commerce and the Aeronautics Branch under Assistant Secretary of Commerce MacCracken.

Mr. Summers who since the first of the year has been airway extension superintendent of the Bureau of Aeronautics, has had intensive training and wide experience in aeronautics. In 1917 he became a member of the First Pursuit Group of the United States Army, serving with this organization until April, 1926. The First Pursuit Group is recognized as one of the crack air units of the world. In June, 1922, he flew with this group from Ellington Field, Texas, to Mt. Clemens, Michigan, a distance of approximately 2,000 miles. This flight established a record in that it was the first time that a large service unit had ever traversed such a distance in tactical formation with small planes and arrived at destination 100 per cent.

Trade Commissioner Summers will cover Central and South America, making his headquarters at the Commerce Department's office in Panama. He will investigate developments in aerial transportation in these areas and assist in the sale of American commercial Aircraft and equipment.

According to Commerce Department officials it is the purpose of the department to increase the personnel in South America on aeronautics work as soon as conditions appear opportune, as it is believed that South American countries offer the best possibilities for the development of air transportation. The problems presented by climate and geography are more similar to those of the United States than those found in Europe and it is felt that the inevitable trend is toward a closer linking up of commercial air lines of the two American continents. Before leaving for his new post Mr. Summers will visit the leading American firms manufacturing aircraft and equipment.

Special Order Pertaining to Licenses

A Special Order and memorandum received recently from the Department of Commerce, Washington, D. C., is as follows:

The following Special Order No. 4 relating to pending applications for licensing aircraft, pilots and mechanics is effective immediately.

All letters acknowledging receipt of applications, and authorizing the operation of aircraft and the action of personnel as licensed under the Air Commerce Act of 1926, and which expire July 1, 1927, are extended until such time as an examination is conducted in accordance with the Air Commerce Regulations and action taken thereon, unless such authorization is sooner revoked for cause.

WM. P. MACCRACKEN, JR.,
Acting Secretary of Commerce

Memorandum to accompany Special Order No. 4

Applications for licenses for aircraft, pilots and mechanics, when received at the Department of Commerce, Washington, D. C., are acknowledged by means of letters of authority directed to the applicant. These acknowledgments authorize the applicant to operate the aircraft or to act as pilot or mechanic pending inspection or examination by a representative of the Department of Commerce.

Some of these letters of authority which have heretofore been issued to applicants expire July 1, 1927. This Special Order pertains to those letters of authority which bear such an expiration date, and hereby extends them until such time as an examination or inspection is conducted in accordance with the Air Commerce Regulations and action taken thereon, unless such authorization is sooner revoked for cause.

WM. P. MACCRACKEN, JR.,
Assistant Secretary of Commerce for Aeronautics.

Western College Has Campus Aero Club

The Aero Club of the California Institute of Technology was formed three years ago for the purpose of bringing together those interested in aeronautics, and to encourage interest in the subject on the campus. Each year the club has made trips to the various aircraft factories and fields in and about Los Angeles, and one trip to San Diego to inspect the Naval Air Station there. The club has also secured speakers on various aeronautical subjects.

The president of the club for the year of 1925-1926, Harry Remington, was in the Air Service during the war. The president for the last college year, Frederick Thearle, is at present finishing a plane of his own manufacture. The plane is a small single-seater biplane, with plywood fuselage and empennage, wings of standard spruce construction and landing gear, interplane struts, and cabane struts of steel tubing. The engine, also of his own manufacture, is a fixed radial with three Le Rhone cylinders and develops forty horse-power. The plane is expected to have a speed of about seventy m.p.h.

Fokker Planes Oxy-Acetylene Welded

Welding by the oxy-acetylene process proved its worth on the recent trans-oceanic flights for the entire main structure of each of the planes, including the fuselage, engine mount, tail skid and ailerons, is made up of seamless steel tubing welded by the oxy-acetylene process. In fact, practically the entire plane is gas welded except the main wing structure which is wood. Wing fittings and many other parts of sheet steel are also gas welded, including intake and exhausted tubing and other parts of the Wright J 5 engines. Of these parts mentioned, the fuselage and tail skid are made of chrome-molybdenum steel tubing. In no other manner could the enormous loading stresses have been evenly distributed.

In the case of the Fokker planes, built by the Atlantic Aircraft Corp. the welding equipment was furnished by the Oxweld Acetylene Co. and the oxy-acetylene gas by the Linde Air Products Corp.

Air License Applications Increase

According to an estimate made recently by the Department of Commerce 2,059 civilian pilots are seeking licenses to operate, while in addition, 1579 applications to license planes and 1,925 applications to license air mechanics are either pending or have been granted.

In view of the increased number of applications received, W. P. MacCracken, Jr., Assistant Secretary of Commerce for Aeronautics, has had to issue a general order allowing applications to come into force as licenses until such time as the overworked inspecting staff of sixteen officials is able to pass upon them.

Major C. M. Young, in charge of registration, expressed the opinion recently that even with the total of nearly 5,000 applications for pilot, plane or mechanic license on hand, the department had not yet heard from all operators. Approximately 300 airplanes already are operated under the department's identification licenses, but not in interstate travel.

International Air Register Being Formed

Ship classification societies in Great Britain, France, Germany, Italy, Norway, Japan and this country are forming an international air register, with the object of classifying the aircraft of the world in the same manner as ships are classified.

The new organization, which probably will become popularly known by its initials as "A.I.R.", will be composed of the American Bureau of Shipping, the British Corporation, the Germanischer Lloyd, the Norske Veritas of Norway, the Registar Italiano, the Bureau Veritas of France and the Imperial Japanese Corp.

High Speed Plane Nearing Completion

Reports from the Kirkham Products Corp. state that the plane in which Lieut. Alford J. Williams, U.S.N., hopes to break the world's speed record is nearing completion. It is expected that the plane will attain a speed of more than 280 m.p.h. with pontoons, and approximately 300 m.p.h. equipped as a land plane. Tests are to be made shortly at Port Washington, L. I., and following will be tests of the plane with ordinary landing gear at Curtiss Field.

The leading feature of the Williams machine will be the Packard 1,200 hp. engine, which has twenty-four cylinders and is stated to be the largest and most powerful airplane engine ever designed. The plane will be virtually a shell for the motor and will require a special runway for the take-off and landing. A landing speed of from 130 to 150 m.p.h. will be required, because of the comparatively small wing area and the weight of the engine.

The present world's record is held by Adjutant Bonnet, of the French Army, who flew 278 m.p.h. in 1925. Before that Lieutenant Williams held the record with 266 m.p.h.

Swedish Air and Rail Lines Co-operate

The Swedish railway administration has entered into passenger carrying cooperation with a Swedish air transport line, selling air trip tickets and advertising the combination railway and air route. This cooperation started with announcement of the combined service between Stockholm and Karlskrona. The railroad carries passengers between Karlskrona and Kalmar, and the airplane carries between Kalmar and Stockholm.

The following is a translation of a section of what is perhaps the first combined railway-airplane time table:

	(Karlskrona-Vasjo R.R.)	
10.50 A.M.	Lv. Karlskrona Ar.	2.15 P.M.
11.37 A.M.	Ar. Vasjo Lv.	1.40 P.M.
2.15 P.M.	Ar. Kalmar Lv.	11.10 A.M.
	(Stockholm-Kalmar Air Line)	
2.55 P.M.	Lv. Kalmar Ar.	10.50 A.M.
5.15 P.M.	Ar. Stockholm Lv.	8.30 A.M.

Airplane trip tickets are sold at the stations on the railroad, and railroad tickets at the aerodromes of the airplane route. The schedule is in operation between May 15 and October 15.

News Notes on National Air Races

Communications from all sections of the country seeking information regarding the National Air Races, to be held in Spokane, September 23, and 24, The National Air Derby, New York to Spokane, September 19 to 21, and the Pacific Coast Air Derby, San Francisco to Spokane, September 21 are being received at the headquarters in Spokane.

Fargo, North Dakota will construct a new aviation field immediately, to care for planes participating in the national air derby race from New York to Spokane, according to a letter received from President Murray A. Baldwin of the Fargo Aeronautic club to the National Air Derby association of Spokane.

Fargo will be one of the five-minute control stations along the New York-Spokane route where all planes must land.

Pilot N. P. Mamer of the Spokane airport left Spokane June 29 by plane on a flight to California, to represent the National Air Derby association of Spokane. During his stop in the California cities he contacted airplane manufacturers and pilots, interesting them in the San Francisco to Spokane air derby and New York to Spokane air derby. He also represented Spokane at the aeronautic show which was put on by the Hollywood Aero Club and Santa Ana Club.

The National Air Derby association of Spokane recently filed articles of incorporation at Olympia. The purpose of the association as set forth in the incorporation papers is to further aviation development and to assist and aid in promoting aeronautics and aviation in general throughout the nation and particularly the northwest. The association will also assist in the improvement and development of aviation fields and especially the field at Spokane. The association will also stimulate aerial activities by offering prizes for races and other similar events.

Maj. Jack T. Fancher, commander of the 41st division air service, Washington National Guard and managing director of the National Air Derby association of Spokane, will shortly make a test speed flight of the route of the national air derby race from New York to Spokane.

"The race back over the course would be for the purpose of observing all the requirements, rules and regulations which will govern the New York to Spokane national air derby," said Major Fancher.

Following the flight, Major Fancher will visit the various airports along the route and stimulate the interest of pilots and manufacturers, visiting various aviation fields and manufacturing plants.

"It will be easy to find organizations to sponsor the race at the various stop and control stations," said Major Fancher. "The spirit of cooperation is being extended us everywhere.

"Government aviation officers are planning to fly to Spokane to see the races and the finish of the derby. Many military aviators who will not take part in the races will fly to Spokane to see them, and aviator sportsmen will also come in large numbers. In speaking to Col. Charles Lindbergh before his history-making hop to Paris, he expressed his desire to come to the national air races if it was 'humanly possible.'"

On account of the large crowds expected in Spokane during the national air races, troops of the 161st national guard infantry regiment stationed in Spokane will be ordered into a second encampment on Felts Field, Parkwater, a few miles from Spokane's center, according to Col. Thomas G. Aston, commander of the infantry regiment. They returned June 29 from American lake, where the troops were encamped for two weeks.

Haskelite to Use Air Mail Extensively

For the double purpose of hastening its mail to the Pacific Coast and western states and of cooperating with the private companies which took over the operation of the air mail line from the United States government on July 1, the Haskelite Manufacturing Corp. of Chicago, large makers of aircraft plywood products, on July 1 began an extensive use of the air mails.

All first class mail to points west of Omaha now goes forward also by air mail. A special letterhead and envelope, printed in two colors, red and blue, the same as the regular air mail envelope, have been prepared for their use. The letterhead and envelope are printed on very thin paper so that a two-page letter, stamped and sealed in its envelope, weighs less than half an ounce, to come within the air mail postage rates of $.10 a half ounce.

Under the new posting arrangement, all letters for first class mail are written in the regular way, except that the first carbon copy is on the special letterhead. The original is signed in the usual way and sent by train mail, and the carbon copy, on the special letterhead and in the special envelope, is sent by air mail, unsigned. Many hours are expected to be saved in this way. On the bottom of the letters sent by regular mail appears the note, "Copy of this letter going forward air mail."

This idea of sending all western mail by air originated with Mr. James R. Fitzpatrick, vice-president and secretary of the company, who has handled aircraft sales for the company practically since its organization in 1917. Mr. Fitzpatrick has kept in close touch with matters aeronautic ever since this date, having been all over the United States and visited nearly all of the large aircraft plants, and he enjoys close acquaintance with many of the executives of the large aircraft companies.

FOREIGN AERONAUTICAL NEWS NOTES

By Special Arrangement with the Automotive and Transportation Divisions, Bureau of Foreign and Domestic Commerce

Rotterdam Flying Field

The Waalhaven Flying Field, Rotterdam, planned and equipped by the Municipality was opened in 1921. It was probably the first aviation field in Europe opened entirely at the expense of a municipality. The original cost of the field was $280,000 for the land and $400,000 for the buildings. Its replacement value is estimated at a somewhat higher figure.

The field is operated by the Koninklijke Luchtvaart Maatschappij voor Nederland en Kolonien (Royal Air Navigation Co.) Other companies maintaining regular services to and from Rotterdam, such as the Lufthansa, are accorded by the management equal facilities in the use of the field. The facilities are sufficient to handle much greater traffic than is offered.

The field lies about three miles in a direct line from the business center of Rotterdam. The ordinary route taken by busses covers more than twice the distance. It passes over the North Island in the Maas river and frequent delays due to the opening of the bridge across the Maas and other bridges in the city are encountered. The K.L.M. bus service from its ticket office on the Coolsingel in the center of Rotterdam leaves one hour before the scheduled departure of the plane.

The field measures approximately 900 by 750 meters, and is made land, earth excavated for the Waalhaven harbor having been used. The surface is entirely smooth and level and is covered with grass. There is no gradient and the field is in excellent condition throughout the entire year.

Red lights are placed on all the principal objects about the field, the hangars, buildings and wireless masts. The masts of all ships in the harbor extension more than 8 meters high must also have bright lights. In the northeast corner of the airdrome is an aerial lighthouse. The wind sleeve is also illuminated at night.

A white circle in the center of the field is visible during the day and horizontal white planks outline the field. The circle has eight red lamps about its circumference and one in the center to indicate the field and wind direction. The wireless aerials are marked by red and white streamers. A striped wind sleeve is flown from a mast mounted on the largest hangar.

There are eight automatic search-lights placed at approximately equal distances about the field. When a plane is due to arrive at night, two of these are lit so that the beams are thrown out in the direction opposite to that of the wind. These lamps are arranged to keep the beams of light at a height above ground not more than three meters.

Each lamp has a maximum candle power of 45,000, the lamps on top of the search-light, which show red, having 1,500 c.p. The diameter of the lens is approximately 22.64 in. There are two brick and steel hangars and one wooden one, all of large size.

There are approximately 60 employees to care for the planes of the K.L.M. which maintains its general repair depot here. Machines of other companies may also be repaired by this force. In addition there are usually twenty employees for various other purposes. Ample supplies of fuel and oil are maintained as well as spare parts for planes used by the K.L.M.

The field is well equipped for a terminal and facilities exist for the ordinary attention necessary after emergency landings. There is a building containing a cafe, a restaurant seating twenty-five persons, and eight bedrooms, in the northeast corner between the administration offices and the hangars.

Complete weather data is posted every hour and copies of most recent maps are given to departing pilots.

Immediately north of the landing field and separated from it by a stretch of ground about 80 meters wide is the southern extension of Waalhaven Harbor, an area of sheltered water with landing dimensions of approximately 1,200 by 1,100 meters. The water here is four meters deep at low tide. It is marked off by buoys, and landing and towing facilities are available. Night landings are prohibited. On May 15 a hydroplane service, one each way daily, will be opened by the Lufthansa on the route Rotterdam-Duisburg-Cologne.

Air Consortium Formed in Rome

An air consortium has been formed in Rome for the purpose of building, trading and operating airplanes, seaplanes, airships, and participating in industrial and aeronautical enterprises. The consortium starts with an initial capital of 1,000,000 liras, but its members have obligated themselves to increase it to 20,000,000 liras. It is reported that to raise the 20,000,000 liras capital, various groups will contribute as follows: Three steamship companies, the Navigazione Generale Italiana and Istituto di Credito Marittimo, for 6,000,000 liras, Lloyd Sabaudo for 2,000,000, an industrial group, organized Chev. Attilio Overo and Comm. Antonio Marescalchi for 2,000,000 each; and the remaining 8,000,000 will be contributed by a banking group composed of the Banco di Napoli, Banco di Sicilia, Banco Commerciale Italiana, Credito Italiano, Banca Nazionale di Credito and Banco di Roma.

Danish Government Will Give Subsidy

The Government recently advised the Danish Aircraft Co. (Dansk Luftfartsselskab) that on certain specified conditions it was willing to cover the Company's deficit, of about 350,000 crowns up to Apr. 1, 1927. The Government also advised the company that during the two remaining fiscal years 1927-28 and 1928-29 of the four years' subvention period it should not expect any subsidy additional to the 250,000 crowns annually already promised. The company was reorganized last year receiving 200,000 crowns from the National Bank and the Danish East Asiatic Co. The company's Jabiru airplanes are about to be fitted with wireless equipment.

Portugal Regulates Air Traffic

A decree, No. 13,537 of April 27, 1927, regulating air navigation over Portuguese territory stipulates requirements to be met by state-owned military and other aircraft, by commercial mail-carrying and other aircraft, and by those visiting from other countries. It is provided that all matters relating to commercial aviation shall be centralized in the Ministry of Commerce and Communication and the Government is authorized to publish regulations.

Air Survey of Wood Buffalo Preserve

An air survey of the Wood Buffalo Preserve, Fort Smith, Alberta, will be undertaken this summer by the Topographical Surveys Departments of the Dominion Government. Two airplanes will be used and they are scheduled to arrive in Alberta about the middle of June. Fort Smith will be the headquarters. It will take about a month to complete the work.

Side Slips

By ROBERT R. OSBORN

AVIATION Magazine had the statement, a few weeks ago, in an article describing the Bellanca monoplane, that "as either wing tank, or, the engine pump or *warble* pump may be used, a dual fuel system is obtained." In answer to the query of Mr. H. L. C. we wish to state that it is necessary to "tune" up all engines before flight, whether or not the ship is equipped with a "warble" pump.

Mr. G. S. I. was an interesting visitor to the office this morning. He dropped in to warn us that if his initials appeared in this column again, he would be after us with a sawed-off shot-gun.

As a number of the projected flights to the United States from European countries seem to be about to get under way, in fact may be on the way or completed before this appears in print, we hope the National Aeronautic Association will lose no time in appointing a group of prominent aeronautical citizens as their Official Pajamas Welcoming Committee. After the splendid receptions given our fliers abroad it would be pretty poor for a flying visitor to our shores to report back home that he had to purchase pajamas his first night here.

• • • •

The newspapers report that there will be published shortly an airplane register, similar in purpose and principle to Lloyd's register of shipping, which "will list and classify every aircraft in the world, giving its maker, size, power and cruising radius. The book, like the shipping register, will be kept up to date by annual revisions."

We'd say that a year is entirely too long to wait for a revision of such a book, if it is to be kept up-to-date. With the help of a few pan-cake landings, hangar doors, amateur designers and mechanics who have been out on parties for six nights straight, a ship can change enough in a month that it would never be recognized. The registry would almost have to be revised weekly or it would have more incorrect numbers than a telephone directory. The exact age of any one ship would be hard to determine also. For instance, one ship with which we are acquainted would have to be reported somewhat in this fashion—

Maker — Whoozis Aircraft Company originally. Since amplified and rearranged by assorted mechanics.
Size — Depends on amount of overbang sawed off wing tips.
Age — Fuselage, 1918 and since
Right lower wing, 3 months.
Left lower wing, 5 months.
Landing gear, now deceased.
Upper wings, purchased from unidentified stranger.
Propeller, 7 months.
Motor, About 10 years, judging by its gear teeth.
Tail surfaces, age indeterminate.
Power — Variable with number of cylinders operating.
Cruising Radius — Within two miles of field.

• • • •

Commander Byrd's excellent demonstration of the value of the collapsible rubber raft reminds us of a conversation in the Bellanca hangar the night before the take-off,—

Carisi—"Whats this big bundle?"

Chamberlin—"It's the rubber boat."

"Shall I put it in the ship?"

"No."

"Now, Clarence. You ought to take it along."

"Alright. Put it in. But leave out those paddles. I'd never make it with those. It would be too far to paddle."

AIRPORTS AND AIRWAYS

Rochester, N. Y.

By Joseph F. Faires

Rochester has several of its own companies. The Imperial Airways, Inc., the youngest acquisition, has a well experienced personnel and does not intend to engage in activities until next Spring. Eric L. Bark is president of this company. Its pilots will be Norman Mallette, formerly with the Huff-Daland company; Fred Foshey, former Boston flier, and Howard Page, of Rochester. Fokkers and Wacos will be used.

The Rochester Flying Service, a subsidiary of the Reynolds Airways, has been engaged in passenger carrying and student training for the past few months and is well in the lead of other local companies. William G. Dunlop, proprietor, is assisted by Otto Emlerton, former New Orleans air mail pilot. Herschel J. McKee, of St Louis, recently flew into the city and delivered a Standard training plane to Bill Dunlop.

Other companies include the Riddick Aerial Service, of which Merrill K Riddick is chief pilot, business manager and instructor. Roy Hylan, student pilot assists Riddick. Williams Aerial Service is managed by Earl M. Williams; Du Val Flying Service with Roy Du Val in charge; and the North Star Aerial Service, Inc., with Gordon and Gilbert Taylor at the head.

The following fields are in operation in Rochester, excluding the Municipal Field: Rouse Partridge, 300 acres, two-and-half miles northwest from the main business district, operated by M. K. Riddick; Shoremont Field, thirty acres, six miles north of the city, on Lake Ontario, fully equipped, operated by Roy Du Val; Clark King Brize Field, seven miles southeast of city and one mile south of Pittsford, sixty-seven acres, operated by Gareth Clark, equipped with three-plane hangar and gasoline pump; Dewey Avenue Field, four miles north of the city, no equipment, temporarily operated by Randy Enslow.

Memphis, Mo.

By Lee R. Buggs

The Second Annual Air Meet was held on June 4 and 5 after having been postponed twice on account of rainy weather. The first date set was May 23 and 24. The following planes and pilots were here at the appointed time: Lieut. F. C. Davies, from Richards Field, Frank Dunn and O. E. Scott with an Eaglerock from St Louis, Chas. Quinn, from Quincy with a Waco, E. K. Campbell, from Moline, Ill., with a Travel Air Cabin Wright Whirlwind job; Bob Jewell with a Standard from Dallas, Tex.; R. A. Pierce from Macomb with a Swallow, Leslie Smith from Springfield, Ill., in a Standard special, Forest O'Brine, with a Standard from Carrollton, Mo.; J. M. Allen, from Columbia, Mo. with a Waco; L. P. Shockley from Dallas, Tex., with a Standard; Don S. Phillips, of Portland, Ore. with an Air-King. All these arrived on Monday, May 23, but the rain and storm made the holding of an air meet impossible. This again demonstrates the superiority of the airplane over all other methods of transpor-

tation. This community was completely shut off from train and automobile for a time by the floods But the airplanes all flew just the same, most of them returning home, as the meet had been postponed.

Some of the planes returned for the postponed meet and the following in addition to the above gave their assistance: John H. Livingston, of Monmouth, Ill, with a Waco-10 and Chas. W. Myers, of Troy, O., with a Waco-10

The principal object of the air meet was to educate the public to flying. Wonderful demonstrations were given by the various pilots The contest for dead stick landing was won by John Livingston, who came within 5 ft. of the mark, with Chas. Quinn second within 6 feet of the mark Another good stunt was the flying upside down by Leslie Smith. Also John's Waco-10 flew across the field with the pilot's hands and feet off the controls

"Jake's" Airport, Towner, No. Dak.

By Jake Bertram

Our Airport has not been very active the past month owing to the fact that the Leach boys sold their Canuck, and Bertram had a little crack up with his Standard.

On June 1 R. O Rudd of Bismark and L. W. Lieb dropped in our our field with an American Eagle for a little visit with us The American Eagle is a nice performing plane and very reasonable in price

On June 10 we had the pleasure of having a call from R. J Coughlan, president of the Westland Oil Co of Scobey, Mont., in his Ryan M2 monoplane piloted by Titus Richards and a passenger, Fred Brandt, of Minot, N D Pilot Edwards gave Bertram and Leach a nice little ride and showed us how nicely the Ryan acted with engine off and hardly losing any altitude This Ryan M2 was powered with a 150 Hisso and performed wonderfully

On July 1 Larry Harris former pilot at the Towner Airport and now at Langdon dropped in on us in the Canuck which belongs to Mr Skinner of Langdon Mr Skinner was a passenger They remained for a few days redoping the Canuck and touching it up Mr Skinner soloed in his Canuck after a six weeks training course under the tutelage of Pilot Harris.

We urgently invite all fliers to make our Airport their resting place whenever near Towner, the best field in North Dakota.

Christening on Alexander Eaglerock at Visalia Cal

June 30 Ends McCook Field Landings

June 30 marks the last day government airplanes were permitted to land at McCook Field Visiting airplanes have practically ceased their visits to McCook Field and are all coming to Wright Field. The flying section of McCook Field will be established at Wright Field soon and will occupy several of the hangars which have been vacated by the 88th Squadron

UNITED STATES AIR FORCES

Advanced Flying School

The present class at the Advanced Flying School, Kelly Field, Tex., is progressing nicely, having had little interference from bad weather Basic flying was completed the first week in June, the class then proceeding to Galveston, Tex., for two weeks' practice in aerial gunnery The class now consists of twenty-nine officers, thirteen cadets, three enlisted men, one U. S Naval officer, one Norwegian officer, and one Cuban cadet

The special observers course started May 2 with twelve Air Corps officers in attendance The personnel of the class includes Maj J. E Fickel and Walter R Weaver, Capt William D Wheeler, Lieuts A B Ballard, Emil C Kiel, Robert H Finlay, Henry H Reilay, W W Welsh, F A Johnson, W K Moran, Gerald G Johnston and Rowland Kieburtz

Coat of Arms for Airship Group

Approval has been given to recommendations for a Coat of Arms for the 21st Airship Group (Balloon) located at Scott Field, Belleville, Ill. The design consists of a duck, a sheep and a rooster, surmounted by a face of the sun god Helios.

There is an historical reason why this famous airship group, organized in 1921 from units which had gained fame during the World War at Lorraine, St Mihiel and the Meuse Argonne, should adopt as their Coat of Arms these peaceful farmyard animals, of which the rooster alone has the faculty of flight, though only over the barn yard fence

It is related that one Montgolfier conducted the first successful balloon ascension This was on Sept 19, 1783 at Versailles, France, in the presence of the King, the Queen, the Court and innumerable people of every rank and age. The hot air balloon had a cage attached to it in which was a duck, sheep and a rooster The balloon raised itself to a height of about 1440 feet, and, being carried by the wind, it fell gradually in the woods at a distance of about 10,000 ft from the point of ascension, having remained in the air 8 min It is related that the balloon fell very gently so that it just bent the branches of the trees upon which it alighted. When it came to the ground the cage broke without serious injury to the animals

Within a few months from this time human beings began to make successful flights as passengers in captive balloons.

The Heraldic description of this Coat of Arms follows

Green and black are the old Air Service colors The duck, sheep and rooster are the first three passengers in a successful balloon ascension The crest is the face of the sun god Helios painted on Montgolfier's balloon, and the motto is the one given to Montgolfier by the French King The face is made gold on the blue wavy background, giving the new Air Service colors

The Motto is:

"Sic Itur Ad Astra". Translated "Thus one Goes to the Skies"

Selfridge Field

Lights for night flying installed at Selfridge Field, Mich., consist of a network of red lights around the edges of the field and a large carbon light with a very large lens which throws a beam of light across the field almost as bright as daylight It is said that this light is of 400 000 c.p Located on the roof of hangar 10 is a very powerful revolving searchlight and it is believed an aviator flying over Detroit on a clear night could easily observe this revolving beam

These lights were modeled somewhat along the line of the lighting system at the air mail field at Cleveland, Ohio Master Sgt Horst W Tittel and George E Moyer, the post electrician, performed most of the work in connection with the installation of the lights

Lieut. Frank O'D Hunter recently made several night flights to test the lighting system and had no difficulty in making perfect landings

Army Officers Attend Mills Field Opening

The dedication and opening of San Francisco's Municipal Airport, known as Mill's Field and located at Millbrae, Cal., proved to be an auspicious event and was attended by many prominent persons in civil and military life. The Army and Navy were well represented, Rockwell and Crissy Fields supplying quotas Among the Army personnel, the Corps Area was represented by Majs H B Clagett and J. Y. Chisum and Lieut. Harold A Moore Those participating in the flights from Crissy Field were Capt W C Ocker, Lieuts J R Glascock, F D Hackett, W. G Bryte, Jr, G E Henry, Master Sgt C W Kolinski and Staff Sgt P L Woodruff

Langley Field, Va.

With excellent weather conditions for flying, the 19th Airship Company, stationed at Langley Field, Va., established a new record on June 2 for a single day in training with nonrigid airships at that station The Airships TC-5 and TC-9 were in the air from 8 00 a m until 8 00 p m, making fifteen flights for a total of about 23 aircraft hr and 170 man hr The airships covered various mission training flights over the Peninsula and especially over Hampton Roads, where the airships stood by and circled over the Battle Fleet, giving the persons on board an opportunity to see them During the day a total of ninety four different men were taken up on these flights

TC-5 In Training Flight

The Airship TC-5 from Langley Field, Va., recently made a 13½ hr. non stop night flight by use of the compass, the voyage being for the purpose of night navigation training and the testing of radio communication facilities

The airship left the hangar at Langley Field at 6 00 p m, passed over Washington at 8 45 p m, Baltimore at 10 00 p m, Wilmington, Del, at 10 45 p. m, reaching Philadelphia at 11 00 p m. After circling around Philadelphia for half an hour the TC-5 turned back to its home station Due to a heavy head wind, the trip down from Philadelphia was delayed a little, the airship arriving at Langley Field at 7 30 a m the next morning

The TC-5 was equipped with radio, and during the entire flight was in constant communication with the various stations along the route as well as in talking communication with the various radio fans and stations. Lieut R R Gillespie, who commanded the airship, had with him Lieut L A Skinner and Warrant Officer R E Lassiter as pilots, Staff Sgt R E Quinn and Sgt H Canine as engineers and Corporal J. Kederis as radio operator

Army Air Orders

Lieut Col John Adams Hambleton, Air Corps Res, Lutherville Md, to active duty McCook Field reverting to inactive status July 13, 1927

Sec Lieut Andrew A Frierson Cav San Antonio detailed in Air Corps and relieved from 8th Cav at Fort Bliss Lieutenant Frierson is ordered to report at Brooks Field

First Lieuts Ira H Eaker Mitchel Field and Lloyd G Jones Pope Field to Chanute Field

Sec Lieuts Archibald Y Smith and Harold G Peterson Air Corps relieved from assignment and duty as students Air Corps Tech Sch Chanute Field and will report to com off Chanute Field for duty

The following officers of the Air Corps Res are ordered to active duty Brooks Field from places indicated and will revert to inactive status June 30 1928 Sec Lieuts Lloyd Radcliffe Ash Dublin Ga Lewis Brewer Griffin Ga, James Willis Crihey Atlanta, Ga Joseph Hellfred Chaille Miami Fla William Jefferson Cresswell Atlanta Ga Harry James Kelly Augusta Ga Julius Theodore Landsberg Savannah, Ga, Halsey Le Dre Mallory, Dresling Ga and Bre Jett Whatley McRae Ga

The following officers of the Air Corps Res are ordered to active duty Brooks Field from places indicated and will revert to inactive status June 30 1928 Sec Lieuts Melvin Alfred Jenner Arlington Wash William Stanton Martin Seattle, Wash Leslie Harry Schwakede Petaluma Cal and Frederic Redford Thompson Seattle Wash

Sec Lieuts Harry Vincent Inskeep Air Corps Res, Dorchester and Ivan Raymond Waller Milton Mass to active duty, Brooks Field reverting to inactive status June 30 1928

Sec Lieuts Warren Stewart Cook Air Corps Res Kansas City Clayton Allen Scott Air Corps Res Ashland Ky Kirk Hamilton Scott Air Corps Res, Floydada Fla and Earl Lilis Shanahan, Mount Vernon, Ill, to active duty Brooks Field, reverting to inactive status June 30, 1928

Sec Lieut Allen Ralph Springer, Air Corps Res Langley Field to active duty Aberdeen Proving Ground, reverting to inactive status June 30 1928

Sec Lieut George Perry Stowell Air Corps Res, Langley Field, to active duty reporting to the com off at that station, and reverting to inactive status June 30, 1928

Sec Lieut Keith Roscoe Air Corps Res Langley Field to active duty Selfridge Field reverting to inactive status June 30 1928

Sec Lieut Roy Sean O Neal Air Corps Res Washington, D C. to active duty Bolling Field reverting to inactive status June 30 1928

Sec Lieut Forrest Lyttle Neville Air Corps Res Langley Field to active duty Fort Sam Houston reverting to inactive status June 30 1928

Sec Lieut George Robert Acheson Air Corps Res, Fort Crockett, to active duty at that station reverting to inactive status June 30 1928

Sec Lieut George Henry Macneir Air Corps Res Fort Crockett to active duty that station reverting to inactive status June 30, 1928

First Lieut. Lloyd C Blackburn, Air Corps, Chanute Field, to Fort Riley

Major Edward L Hoffman Air Corps Cincinnati to Washington, D C

First Lieut Howard Z. Bogert Air Corps McCook Field, to Wright Field.

Sec Lieut LeRoy Hudson, Air Corps Res., Tex., to active duty, Brooks Field reverting to inactive status June 30, 1928

First Lieut Bernard S Thompson, Air Corps, Washington to Kelly Field

Sec Lieut Edward Harrison Alexander Air Corps Res Urbana Ill to active duty Brooks Field reverting to inactive status June 30 1928

Capt Joseph H Hutchison Air Corps Fort Crockett, to March Field

The following second Lieutenants are detailed in the Air Corps and will proceed to Brooks Field from places indicated Robert H Naylor Corps of Eng Los Angeles George W McGregor Field Art., New York City Charles A Herrington Corps of Eng Pittsburg William H Minter Corps of Eng Ardia Frederick E. Dri Coast Art Corps Grangeville Maurice E Daly Field Art Hartford Fred W Knoeck Signal Corps Hooges Wis George F Peirce Coast Art Corps Elkins, W Va Palmer W Edwards, Coast Art Corps Berlin Edward F Mechling Cav McLean Va Julius T Flock Sig Corps Mobile, Ala Frederick A Grambeir Field Art., Merrill Wis Samuel J Simonton, Field Art Allentown Pa James D Curtis Coast Art Corps Jackson Mich Orrin L Grover Coast Art Corps New York City John A. Schwab Field Art New York City Milton M Towner Field Art. El Paso Robert C White, Field Art Buffalo N Y Joseph Granbi Jr Field Art Springfield, Mass, Fay R Upthegrove Inf New City Pa. Matthew K Deichelmann Coast Art. Corps Bayonne Ernest G Schmidt Inf. Tipton Iowa William I Phelan Inf Waterbury Conn David M Hrckmrn Inf Twin Falls, Idaho Bernard C Rose Inf Two Harbors, Minn John W Kirby Inf Racine Wis Marion Huggins Inf Timmonsville S C, Frederick Fenster Jr, Inf San Francisco James W Smith Jr Inf Ruffin S. C Neil B Harding Inf Beverly W Va Robert L Easton Inf, South Orange N J., Fred Leroy Thorp Inf, Ft. Mills, P I, William R F Bleakney Inf, New York City

Sec. Lieut. Clarence W Bennett Cav is detailed in the Air Corps He is relieved from assignment to the 8th Cav (1st Cav Div), Fort Bliss, and will report to the commandant Air Corps Prim. Sch, Brooks Field

Sec Lieut Joe L Lautzelheuser, Air Corps Kelly Field, to Chanute Field.

Maj James F Chaney, Air Corps is relieved from detail with the Org Res 9th Corps Area and will remain in his present duty in connection with procurement planning with station in San Francisco

Sec Lieut Frederick William Ott, Air Corps Res., Cleveland, to active duty Maxwell Field reverting to inactive status June 30, 1928

Sec Lieut Lloyd Harrison Tull Air Corps Res, Washington, to active duty Brooks Field reverting to inactive status June 30 1928

Capt Burdette S. Wright Air Corps, Kelly Field, to Washington

The resignation by First Lieut Courtney Whitney Air Corps, of his commission, accepted

Sec. Lieut. Gordon Philip Saville, Air Corps Res., Mitchel Field to active duty at that station reverting to inactive status June 30 1928

Sec Lieut Charles Bernard Overacker Jr Air Corps Res, Mitchel Field to active duty that station, reverting to inactive status June 30, 1928

Sec Lieut Robert Ingersoll Hazen Air Corps Res Aberdeen Prov Ground Md to active duty Bolling Field reverting to inactive status June 30 1928

Sec Lieut Hoyt Leroy Prindle Air Corps Res., Mitchel Field, to active duty Selfridge Field reverting to inactive status June 30, 1928

Sec Lieut Clarence Wilbur Hodson Air Corps Res, Mitchel Field, to active duty Selfridge Field reverting to inactive status June 30, 1928

Sec Lieut Frank Hamlet Robinson, Air Corps Res, Mitchel Field, to active duty Selfridge Field reverting to inactive status June 30, 1928

Sec Lieut Preston Waldo Comlarck Air Corps Res Hinsdale, Ill. to active duty Brooks Field, reverting to inactive status June 30 1928

Sec Lieut Syndey David Bolman Air Corps Res Malden Mass. to active duty Brooks Field reverting to inactive status June 30 1928

Navy Air Orders

Lieut (jg) Willis E. Cleaves det. Nav Air Sta Pensacola to VJ Div 2 Aircf Sqd Scfg Flt

Lieut (jg) Derald S MacMahon det. Nav Air Sta Pensacola to VJ Sqd 1 Aircraft Sqd, Battle Fleet

Lieut. Errol R. Feeney det. Nav Trng Sta, Newport to Aircraft Sqd., Scfg Fleet.

Lieut. Percy J Hutchison det USS Vestal, to Aircf Fact, Navy Yard, Phila

Chief Pay Clerk Clifford W Waters det Nav Air Sta, Anacostia to USS Sapelo.

Lieut. (jg) Francis B Johnson det. VT Sqd 2 Aircf Sqd, Battle Fleet, to Nav Air Sta Coco Solo C Z

Capt Lloyd N Scott det Nav Air Sta, San Diego to USS Langley

PUBLISHER'S NEWS LETTER

The way aeronautics has almost monopolized the news in the press of the country since the trans-Atlantic flights were organized is a phenomena that has made even experienced newspaper men wonder. It is customary to say in newspaper offices that a news story loses interest after three days. This may be true with ordinary events but extraordinary flights—and murder trials—last until every bit of news interest has been squeezed out of the event. It may be well to try to analyze the underlying reasons for this continuing interest in aviation news stories. While the world is always eager for romantic exploits and heroes, this alone does not explain the unparalleled publicity that the recent flights have received.

All news is judged by four elements. How near is it? How prominent are the people? How much money is involved? How out of the ordinary is it? Put this test to the news that appears on the front page of any large newspaper and the reason for the playing up of the leading stories can be determined almost invariably. A minor event nearby is given great prominence in local papers and yet it never appears in other cities. The reason for this is obvious. In the same way, news of people who are well known only locally appears in local papers but the least bit of news concerning a nationally known character is printed in every paper throughout the country. President Coolidge, Henry Ford, Thomas A. Edison, Mary Pickford, are instances. They can hardly stub their toes without it being a news story. As to money; this interest is ever present everywhere. If a man steals a few dollars, it is of little interest but the news value grows as the amount increases. If a fifty million dollar company is formed, that is news. But the last criterion is the most subtle of all. There is an old newspaper saying: "If a dog bites a man, that's not news; if a man bites a dog, that's news." Anything done differently is news. Any happening, no matter how trivial that has some novel feature seems to have a strange attraction to the newspaper reader. Test aviation news by this process.

* * * *

Everything that happens to aircraft appears to the public to be extraordinary. No matter how often people have seen airplanes, they always crane their necks to see a plane pass overhead. When a record is being made or a special stunt executed, then public interest reaches fever heat. Recently, World's records of the most extraordinary character have been attempted and made. Money has been involved in some cases but this is of small importance as news except when it reaches sizeable proportions as in the case of the large offers to Col. Lindbergh. The $25,000 Orteig prize received great publicity over a period of five years, but it was overshadowed by the spectacular and romantic idea of joining the metropolis of the United States with the Capital of France by air.

* * * *

So far as proximity is concerned, aircraft annihilates distance and space so that a local flying take-off in St. Louis in the morning may be a big "break" in the news by its landing in New York in the evening. This is one of the elements of aviation that gives it a peculiar news value. It is never local except when accidents occur and in these unfortunate news items the prominence of the pilot controls. A flier who has made his name known to the public or who is prominent in other ways or who is wealthy puts an accident on the front page. A gypsy pilot crashes and only the local papers play it up. But here again is an interesting fact. As soon as a pilot makes a remarkable flight, he becomes famous. From the days of the Wrights, Curtiss, Martin and Beechy, each year has produced its air "heroes." Byrd, Dargue, Lindbergh and Chamberlin are now household names and every move they make is given to the public with the greatest intimacy and detail. And so aviation news takes its place in the front rank for it is usually extraordinary, the people are well known or will be soon, it is seldom local and, now, large rewards come as the result of flying achievement.

* * * *

Much is heard about the sporting side of flights, every sort of a reason is given, except one, for the attempts. No one ever mentions that the financial reward may have some influence on the adventuresome. When newspaper syndicates will pay $50,000 for a few signed articles, usually written by somebody else, when all the accessory manufacturers will pay for the advertising value of having their product used on an epoch making flight; when lecture bureaus are clamoring for new talent at from $500 to $1,000 a night, the great incentive to achieve the spectacular must be evident. But behind it all is the great publicity and all its sensational attractions. Probably the news of no single international event has ever exceeded the publicity received by Col. Lindbergh. Aerial fame will be a goal that will be attempted by many. It will be a temptation that will lure many to attempt the impossible.

Where to Fly

CONTINUED

This Section Is Growing With Every Issue

INDEX TO ADVERTISERS

The Aircraft Service Directory

WHERE TO PROCURE EQUIPMENT AND SERVICES

The Aircraft Service Directory

WHERE TO PROCURE EQUIPMENT AND SERVICES

The Aircraft Service Directory

WHERE TO PROCURE EQUIPMENT AND SERVICES

HARTZELL PROPELLERS ARE RELIABLE

BUILT ON HONOR — THEY ARE GIVING EFFICIENT SERVICE ON ALL CLASSES OF MILITARY AND COMMERCIAL AIRPLANES

Contractors to U. S. Government and Commercial Manufacturers

New OX Walnut Propellers for Quick Shipment

HARTZELL WALNUT PROPELLER CO.
PIQUA, OHIO

The Goggles that Protect

Look for this trademark

NON SHATTERABLE
RESISTAL GOGGLES

Write for catalog
STRAUSS & BUEGELEISEN
30 Front St., Brooklyn, N. Y.

Daniel Guggenheim School of Aeronautics

Courses in Aeronautical Engineering and Industrial Aviation. For particulars apply to the Dean of the College of Engineering,

N. Y. University, University Heights, New York, N. Y.

Brand New

LIBERTY & OXX6 MOTORS

GRANT MARINE MOTOR CO.
10435 SHOEMAKER AVE., DETROIT, MICH.

AIRPLANE COVERS

NEWLY MADE GRADE A COTTON COVERS

Complete set, Jenny $100.00; Canuck $105.00, Standard $110.00

	JN	CAN	STD		JN	CAN	STD
Fuselage	14.00	14.00	14.00	Center sec.	3.00	3.00	3.00
Aileron ea.	4.00	4.00-3.00	5.00	Rudder	4.00	4.00	4.00
Fin	1.75	1.75	1.75	Elevator ea	3.00	3.50	3.50
Turtle back	1.75	1.75	1.75	Upper wing	15.00	15.00	18.00
Hor. stab.	7.00	7.00	7.00	Lower wing	13.00	15.00	15.00

Fit guaranteed. *Send 25% with order*

Sweebrock Aviation Co., 2127 Fairfield Ave., Ft. Wayne, Ind.

JN4D, JN6H, CANUCK, DH, T.M. STANDARD
HISSO & OX5 MOTORS

Wholesale and retail, single or carload.

PARTS WINGS INSTRUMENTS DOPE TAPE PROPS PLUGS

SOUTHERN AIRWAYS INC.
210 COLLEGE ST., SAN ANTONIO, TEX.

Aircraft Patents
Wind Tunnel Tests

Herman Jakobsson, A.S.M.E.
Reg. Pat. Attorney, Cons. Engineer

Phone Shepherd 2935
228 Spruce Ave., Tak. Prk., Washington, D. C.

THE UNIVERSITY AERIAL SERVICE COMPANY
UNIVERSITY AIRPORT, AUSTIN, TEXAS

Largest and best equipped commercial field in the Southwest. Prepared to meet your every need

HISSO MOTORS, OX5 MOTORS AIRPLANE ACCESSORIES
Rebuilding and overhauling Hisso motors our specialty

WACO DISTRIBUTORS WACO
(New ships and parts carried in stock at our field)

Year-round school offering complete flying course conducted by

THE UNIVERSITY SCHOOL OF AERONAUTICS

Amateur SPORTPLANE Builders

you have been waiting for this booklet on Balance, Stability Controllability and Design of a Light-plane.

Charts, Materials used, Illustrations and Nomenclature of the modern Sportplane are included

Send ONE dollar to DONALD L. J. SMITH
1247 Loma Vista Drive Long Beach, California

We have for immediate delivery, new Liberty motors, Hispano parts, spark plugs and forty planes of various types and makes, also U8D, U6D, Curtiss and Hisso motors.

PACO PRODUCTS

PAYNE EXPORT AND IMPORT CO.
150 Broadway, New York City

ALL METAL PONTOONS

The Fairchild Airplane Manufacturing Corporation has developed and manufactured a new type of all metal pontoons for ships in the thousand pound payload class. Deliveries can be made on very short notice.

Fairchild Airplane Mfg. Corporation
Executive Offices — 270 West 38th St., New York City
Factory—Farmingdale, L. I., N. Y.

WHEN YOU WANT to buy, sell or exchange planes, motors and accessories—or are in need of competent help, or seeking a responsible position AVIATION Classified or "Directory" ads will prove advantageous. AVIATION, as the only weekly, covers your entire field first.

WATER IS THE PEOPLE'S SUMMER PLAYGROUND. EQUIP YOUR PLANE WITH EDO METAL FLOATS AND MAKE EVERY PLAYGROUND YOUR LANDING FIELD. OVER-WATER FLYING HAS A LURE ALL ITS OWN AND PAYS WELL. WRITE FOR PAMPHLET.

Waco-9 owned and operated by the New England Aircraft Co., equipped with duralumin floats manufactured by

EDO AIRCRAFT CORP.
College Point, Long Island, N. Y.

AIR CHUTES IRVIN

"For Safety in the Air — Everywhere"

IRVIN AIR CHUTES have been developed to their present high state of efficiency by several years of the most extensive scientific research and tests

IRVIN AIR CHUTES have saved the lives of over 75 aviators in various parts of the world in emergencies covering practically every form of aircraft accident

IRVIN AIR CHUTES are the standard life-saving equipment for all Air Forces of the United States, Great Britain, and many other Governments.

Illustrated literature on request

IRVIN AIR CHUTE COMPANY, INC.
523 MAIN ST. BUFFALO N. Y.
Cable Address "Irvin Buffalo N. Y. USA"

More and more, shrewd buyers of aircraft are coming to depend on

TRAVEL AIR

Choose YOUR airplane carefully. Choose Travel Air—you won't go wrong!

Literature on request.

TRAVEL AIR MFG. CO., INC.
Dept. A WICHITA, KANSAS.

DOPE
THE MOST ECONOMICAL SCHEME YET PRODUCED.

TI-TWO

REGISTERED TRADE MARK

MADE BY
TITANINE, Inc.
UNION, UNION COUNTY, N. J.
Contractors to U. S. Government

Keeping Abreast

of aeronautical activities is possible only by reading

AVIATION

each week. Yearly subscription rates: United States $4; Canada $5; Foreign $6.

AVIATION
250 W 57TH ST. NEW YORK CITY

CLASSIFIED ADVERTISING

10 cents a word, minimum charge $2.50, payable in advance.
Address replies to box numbers, care AVIATION, 250 W 57th St., New York.

HELP WANTED

WANTED for Gates Flying Circus two licensed transport pilots Must thoroughly understand Hissos Also two good all-round airplane mechanics, best paying job in country to right men; old timers only Novices save stamps Address mail only, giving full qualifications first letter Gates Flying Circus, 735 Whitehall Building, New York City

WANTED: Students to work out part of flying instruction in new airplane factory Get pay for your ground work time by associating with men who design, build and fly airplanes Do not apply unless you mean business and can come at once Write Lee Briggs Memphis Mo

WANTED Designers having considerable experience in airplane manufacture, Permanent employment State age, salary desired technical education, or other qualifications in first letter, Box 644 AVIATION

WANTED: Draughtsman and engineers experienced on aircooled aircraft engines Give qualifications, experience and salary expected first letter Excellent openings for the right men Box 647, AVIATION

WANTED: New OX5 Motors State quality, location and lowest cash price Box 646, AVIATION

Parachute Jumpers furnished for any locality All jumpers use army type 'chutes. No bag 'chutes Jumpers who have opening dates send dates and qualifications in first letter. All inquiries on parachutes gladly answered Write Joe Crane, Box 251, Scottsdale, Penna

WANTED: Experienced pilot at once, with good past record; steady position, state salary expected The Robbins Flying Service, Cuyahoga Falls Ohio

POSITIONS WANTED

Ex-Army Pilot still flying regularly in the reserve, desires a position as pilot Have also had considerable experience in the automobile business Box 645 AVIATION

Ex-Army pilot five years experience as commercial pilot desires connection with reliable company Sales experience, some flying past six months, best of references L W Sylvester Dallas S D

EQUIPMENT WANTED

WANTED: Biplane or monoplane with Wright Whirlwind Will trade Packard eight phaeton and pay difference or pay cash Room 650 Baltimore Hotel Kansas City Mo

FOR SALE

FACTORY for sale or lease suitable for airplane manufacture or parts, in Elmira, N Y Address W A Lewis, Norwich, N Y

CURTISS C-6A, 160 hp motor, equipped with two Bosch magnetos had four hours since overhaul Complete with hub and miscellaneous parts, $600 P O Box 4111 Tampa, Fla

FOR SALE: Curtiss J N recently overhauled, in fine condition, $650 Harold Christensen Boston Airport

FOR SALE One 180-Hisso Standard first class condition Fifty-five gal tank, ladder for front cockpit One OX-5 Standard with 32 gal tank Both ships have DH wheels, silver wings and blue fuselages Engines overhauled last fall and ships stored in hangar. One 150 Hisso, Hisso radiator, oil radiator and 45 gal gas tank Finger Lakes Airport, Geneva, N Y Eaglerock Dealers for Western New York.

FOR SALE Waco 9 in finest condition, dual control and compass, R S Hendland, 216 Center Avenue Butler Pa First here, first served.

Will trade my luxurious Brougham car for used Swallow or Waco, might consider good Hisso-Standard Gus Palmquist, 4711 N Whipple St, Chicago, Ill

FOR SALE Buhl-Verville Airster, 3 place—OX5 motor, flown 60 hr perfect condition $2100 cash Extra Hammond-port OX5 motor in original crate $350 at Buffalo Airport R F Taber, 1165 Delaware Ave., Buffalo N Y

FOR SALE Sikorsky Oriole, with brand new 180 hp motor installed, also an extra 180 hp motor E H Burgin, 109 Front Street, Mineola, L I., N Y

WHAT am I offered for one Curtiss M F flying boat, with new OXX6 motor, and a good OX5 Jenny? Box 256, Lawton, Mich

FOR SALE: Curtiss Seagull, Loening air Yacht and Liberty motors Curtiss Metropolitan Airplane Co., Port Washington, Long Island, N Y

FOR SALE brand new OX5 motors, complete in original crates in quantities from one to twenty-five J. Carroll Cone, Little Rock, Arkansas.

FOR SALE JN-4D landing gears, complete with white shock and axle, long or short, like new $35.00 each All kinds of wires, struts and fittings, Hisso nose radiators like new, $35.00 each Hisso 150 180 copper-tipped props, $35.00 each. All material A-1 condition, like new. G D Ludue, 1569 Calif St, San Francisco, Cal

FOR SALE M F flying boat just overhauled with new ribs and bottom, with model A Hisso motor New Orleans Air Line, New Orleans, La.

FIRST LINDBERGH

Now CHAMBERLIN!

PROVE AGAIN THE SAFETY OF FLYING

This booklet, Bulletin No. 17R describes and shows the low cost of flying and includes descriptions and illustrations of nearly 30 airplanes of the most important American manufacturers powered with Wright Engines.

Many Wright Whirlwind Engine owners get 8 to 10 miles per gallon and use less than one quart of oil per 100 miles. Flying from 20,000 to 30,000 miles without overhaul or even cleaning carbon is a common occurrence. Whirlwind Engines are reliable for 125,000 to 150,000 miles of normal flying. Write for this Bulletin No. 17R today.

THE recent Trans-Atlantic Flight Achievements of Lindbergh and Chamberlin prove again to the general public the actual safety and reliability of modern airplanes powered with Wright Whirlwind Engines.

With a record of over 1,750,000 miles in safety in 1926 in private and commercial flying, Wright Engines today stand preeminent in the aeronautical field.

The assurance of safety has been the only point which has deterred many persons from owning an airplane for pleasure or business. The past two year record of Wright Engines and especially designed Wright Engined planes, however, has finally removed any further uncertainty. Today dependable pilots under government license are immediately available for regular employment to teach you to fly while piloting your plane.

Well proved planes from the designs of leading American manufacturers, powered with Wright Engines for every type of flying, including open sport planes, closed family and passenger planes, cargo planes, seaplanes, planes that take off from land or water, or big tri-motor airliners as comfortable as a yacht are available for your inspection and consideration at reasonable cost.

That's why More Pilots fly them!

Your plane is ready!

In the meantime write for the interesting non-technical Bulletin No. 17R described elsewhere.

WRIGHT AERONAUTICAL CORPORATION · *Paterson, N. J., U. S. A.*

WRIGHT